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AIR and MANEUVER WARFARE

Martin van Creveld
with Steven L. Canby
and Kenneth S. Brower





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Air Power and Maneuver Warfare

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for
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Foreword

An essential part of the Air War College, Maxwell Air Force Base (AFB), Alabama, curriculum consists of the study of military history and specific campaigns. Distinguished military scholars often visit the college to discuss and explore issues with the faculty. Martin van Creveld was one of those distinguished scholars. He had previously been commissioned by the Air Staff to investigate the effects of the US Army's move toward a more maneuver-oriented kind of warfare and the effect that move will have on the US Air Force role on the battlefield. The Air Staff was concerned about a host of issues: logistic support for a highly mobile force; friendly force confusion on huge, rapidly changing battlefields; close air support with or without air base support; and a host of other issues. The bottom line for the Air Force concerned several issues of great impact. First, Must air combat change because land combat is changing? and, Is the decisiveness of air power increasing geometrically to the point where the twenty-first century will find it is as decisive as ground power was in the twentieth century?

Our guest historian agrees that sophisticated, highly technical air and space developments may have made air power dominant on the conventional battlefield. The great exception, however, lies in the trend away from conventional to unconventional conflict. To Professor van Creveld, nation-states have lost the monopoly on the legitimate use of violence. To prepare for a conventional scenario is to prepare for the last war, not the next one. The possibility of more "Lebanons" is much higher than the likelihood of future "Iraqs."

The Airpower Research Institute (ARI) of the College of Aerospace Doctrine, Research, and Education (CADRE), Maxwell AFB, Alabama, also became interested and

wished to comment on the entire study. Regardless of the fact that the kinds of warfare may be changing, the experience of the Israelis, the Luftwaffe, and the Soviet air force in supporting fast-moving forces is instructive to an air force that promises to support a steadily faster-moving army.

And so the discussion went, with both sides learning much. We invite your interest and dialogue, and invite you to visit Maxwell AFB, Alabama. As the Air Corps Tactical School in the 1930s became central to developing air power theory and doctrine, so will that same role be adopted by the Air War College and the Airpower Research Institute in the 1990s. The Gulf War was a watershed for air power; there will never be another just like it, nor will there be an opportunity to fight it again.



PETER D. ROBINSON
Major General, USAF
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*About
the Author*



Martin van Creveld

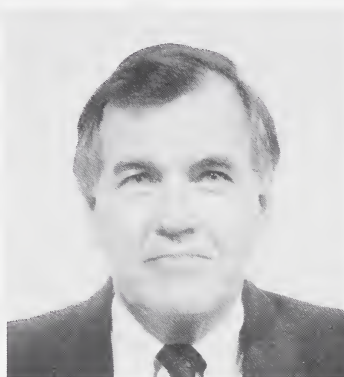
Martin van Creveld was born in the Netherlands but raised and educated in Israel. After taking his master's degree at the Hebrew University, Jerusalem, he read for a doctorate in history at the London School of Economics. Since 1971, he has been on the faculty of the history department at the Hebrew University, where he is now a full professor. At present, he is the first occupant of the Oppenheimer Chair for Warfighting Strategy at the Marine Corps University, Quantico, Virginia.

His most important publications are *Hitler's Strategy 1940–1941: the Balkan Clue* (1973); *Military Lessons of the Yom Kippur War: Historical Perspectives* (1975); *Supplying War: Logistics from Wallenstein to Patton* (1979); *Fighting Power: German and U.S. Army Performance, 1939–1945* (1982); *Command in War* (1985); *Technology and War: From 2000 B.C. to the Present* (1989); *The Training of Officers: From Military Professionalism to Irrelevance* (1990); *The Transformation of War* (1991); and *Nuclear Proliferation and the Future of Conflict* (forthcoming).

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The author wishes to extend his heartfelt thanks to the following contributing authors who willingly provided their time and expertise to this project.

Kenneth S. Brower is a defense analyst and naval engineer. An internationally recognized author and lecturer on defense affairs specializing on the interaction of doctrine, tactics, and technology, he was widely seen and heard on US television and radio networks during Operation Desert Storm. Among numerous ship designs, Mr Brower was responsible for the *Ticonderoga*-class Aegis cruiser, as well as a number of other ship designs. He has specialized in conducting comparative studies of US and international ships and weapon systems. He is currently president of Spectrum Associates of Springfield, Virginia, a defense-consulting firm.



Kenneth S. Brower

Dr Steven L. Canby, an economist and defense analyst, is a well-known author and lecturer specializing in military doctrine, manpower, regional security, application of technology, task specialization, and European defense integration. He was among the handful of analysts responsible for inducing the change in the American style of war from firepower and attrition to maneuver. He is a graduate of West Point; the Infantry School's airborne, ranger, and commander courses; Command and General Staff College; and Harvard University. He is currently president of C & L Associates of Pontiac, Maryland, a defense-



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consulting firm, and an adjunct professor in military history and the operational art of war for Georgetown University's graduate program in national security studies.


Any errors or omissions remain my own, but the quality of this effort has been solidly improved by the contributing authors.

Preface

In the form it has finally assumed, this volume falls into two very different parts. Part 1 was written by Dr Steve Canby, Ken Brower, and myself at the invitation of Air University, Maxwell Air Force Base, Alabama. It represents our joint attempt to clarify the relationship between air power and maneuver warfare since 1939, a subject that derives its importance from the fact that maneuver warfare has been the US Army's official doctrine since the early eighties and remains so to the present day.

By contrast, part 2 was added *ex post facto*. It contains the collective wisdom of the military doctrine analysts of the Air University on the same subjects, as well as the way in which we have presented them. The reader is invited to wade through the entire volume and draw his/her own conclusion about the past, present, and future of air power on the one hand and maneuver warfare on the other, assuming indeed that they do have a future.

In bringing this volume to print, I should like to thank several people who in various ways were instrumental for its genesis, production, and completion. The first is Dr Steve Canby who, in addition to writing some of the chapters, assumed much of the administrative burden connected with the contracting side. Another is Lt Col Andrew Ogan who acted as liaison between the authors on the one hand and the Pentagon and the Air University on the other. Finally, it is necessary to commend Mr Ted Kluz of the Air War College for persistence and determination. Not only was the original idea of doing this study his, but he has guided and supported it throughout the publication process. If it finally sees the light of print, much of the credit is his.


Martin van Creveld
Mevasseret Zion, Israel
March 1993

Introduction

The end of the cold war has been compared to a monumental shift in the tectonic plates.¹ Even as the collapse of the Eastern bloc caused the most important threat to American security to disappear, it has unleashed a host of changes that will irrevocably reshape the strategic landscape. Beyond doubt, these changes have enormous implications for US national security policy and military strategy.² Just how they may play out cannot be known. Therefore, intellectual preparation, planning, and at least some training for any contingencies that may arise must go on.

As far as can be foreseen at present, future threats to American security and interests will almost certainly be one of three types, which are discussed here in order of increasing magnitude and decreasing probability. The most likely type will come from nonstate actors or from those states which, impressed by the enormous American capacity for conventional warfare so recently demonstrated in the Gulf, will resort to other means. To counter a threat of this kind—be its name guerrilla war, terrorism, low-intensity conflict (LIC), or, to use my own terminology, *nontrinitarian warfare*³—both air and ground forces will probably be required. The former will consist principally of helicopters and light, fixed-wing transport aircraft, the latter of light troops (in general, nothing heavier than lightly armored vehicles will be appropriate). Since firepower in such a war will be delivered by light, highly accurate weapons, the logistic burden will almost certainly be small compared to the conventional conflicts of the past. This is not to say that only primitive technology is likely to be of use. Light does not necessarily mean simple; and indeed, one can easily envisage the employment of some very sophisticated devices. The point is that in such warfare, the most important role of whatever heavy forces get involved may be not that of fighting but of standing by and maintaining escalation dominance.

Next, as happened recently in the Gulf, the challenge may come from a country like Iran, which, though not a great military power, is nevertheless strong enough to represent a substantial conventional threat should its rulers try to imitate Saddam Hussein. In such a conflict, and provided only the appropriate bases are available and secure, the USAF is likely to shine. At present, and as far ahead as one may look, no other country possesses the hardware, much less the “software,” needed for mounting an air campaign that will even remotely compare with US capabilities in this field. Admittedly, it is quite possible that, under such circumstances, air will inflict sufficient pain and attrition to do the job almost on its own, as some allege was the case in the Gulf. On the other hand, the possibility of a ground campaign’s being necessary—which was also the case in the Gulf—cannot be ruled out. Either way, the logistic burden is likely to be substantial. Cutting the enemy’s supply lines while protecting and managing one’s own will be important.

Third, the possibility of a reconstituted Soviet (Russian) threat must be considered. At the moment, such a possibility appears almost too remote to contemplate; still, it cannot be entirely ruled out. There have been press reports about alleged Pentagon plans to aid Lithuania against a Russian invasion. Perhaps more important, there is the worst-case scenario involving the former Soviet armed forces as a military as strong and sophisticated as one’s own. If only by way of an intellectual exercise, examining these forces—and devising ways to counter them—will provide a yardstick against which to measure all other, presumably less dangerous, contingencies.

As already indicated, each of the above three scenarios will assuredly require some form of air operations, ground operations, and logistics; nevertheless, this study is only concerned with the latter two—in other words, those on the more intensive end of the spectrum. This is not because LIC is unimportant. On the contrary, this author believes that it is probably the most important of all and one that air forces in general, and the USAF in particular, should take much

more seriously than they do.⁴ Rather, it is because the question of LIC is seen as essentially different from, and almost independent of, the others. Almost by definition, LIC is diffuse and lacks any clear center of gravity. This means that it gives but little scope for examining the real issue facing this study: the way to integrate air power on the one hand with maneuver warfare on the other.

While American commanders such as Robert E. Lee and George S. Patton excelled in maneuver warfare, the latter's present prominence is an outgrowth of the Vietnam War. Following its failure in that conflict, where it engaged in pure attrition ("search and destroy"), the US Army during the late seventies started looking around for a different style of war. In doing so, it hit upon the German campaigns of 1940–42 and took them as its example. In 1981, it issued a new and radically revised version of its main manual, Field Manual (FM) 100-5, *Operations*. Since then, maneuver warfare has become the official standard for the US Marine Corps also and has recently been incorporated into its Fleet Marine Forces Manual (FMFM) 1-1, *Campaigning*. Nevertheless, the meaning of maneuver warfare in terms of actual tactics, organization for combat, and the internal design of units has not always been clear. This is all the more the case for the US Air Force, which has continued to procure much the same aircraft as before and also has continued to plan missions, allocate sorties, and attack targets in a seemingly unchanged manner.

To address the relationship between air power and maneuver warfare, including the logistic aspect of the latter, this study is constructed as follows. Chapter 1 is analytical, offering a discussion of the nature of maneuver warfare, its dominant concepts, and the way of thought that it represents. Chapters 2, 3, 4, and 5 consist of case studies. Arranged in chronological order, they describe the German campaigns in Spain (1936) and in France and the Low Countries (1940), the German campaign in Russia (1941), Soviet operational warfare (1941–45), and the Israeli experience (1967 and 1973), respectively. The final chapter

pulls the threads together. In essence, it argues that maneuver implies a transformation of applied air power from “tactical” to “operational,” with a corresponding shift in the method of sortie allocation and aircraft mix. In maneuver warfare, close-in battlefield interdiction is as important as ever but is becoming increasingly an army mission undertaken by attack helicopters and multiple launch rocket systems (MLRS). Further behind the enemy’s front, operational air warfare entails a shift away from random attacks against supply lines towards a highly focused effort to destroy follow-up forces, prevent counter-attacks, and isolate the battlefield. This shift in the use of air forces from tactical to operational is akin to using a fission weapon as a trigger for a fusion device. Whereas “tactical” merely uses the power of tactical aviation on its own, “operational” leverages it and produces new levels of synergy in the interactions of ground and air forces.

Notes

1. Chairman, Joint Chiefs of Staff, *Overseas Mission Study* (Washington, D.C.: Department of Defense, June 1991), 1-1.
2. Ibid.
3. Martin van Creveld, *The Transformation of War* (New York: Free Press, 1991), particularly chapter 2.
4. B. Nietschmann, “The Third World War,” *Cultural Survival Quarterly* 11, no. 3 (Fall 1987): 1-16.

Chapter 1

The Nature of the Beast

This chapter first discusses the fundamentals and the basic underlying concepts of maneuver warfare. To add depth, it then draws a comparison between maneuver-style warfare on the one hand and attrition-style warfare on the other. Finally, it discusses the implications of this type of warfare for logistics.

As a style of war, maneuver is as old as war itself. This does not mean that war can consist of maneuver alone, although that may represent a desirable ideal in theory. In practice, however, fighting and bloodshed almost always form an integral part of warfare, for without them, maneuver degenerates into sterile exercises and endless shadowboxing as forces are moved about a chessboard. Nevertheless, it is true that maneuver attempts to minimize actual fighting. Before the fight, maneuver warfare seeks ways to place the enemy at a disadvantage by taking up favorable positions, or else by first taking on part of the enemy's forces within a limited area so as to obtain a subsequent advantage over the force as a whole. Once the fight is over, it seeks to take maximum advantage of the outcome by pursuing the enemy, keeping him off balance, and striking into his vitals.

Historians often find the supreme model for maneuver warfare in the campaigns of Napoléon, and with good reason. The endless combinations and recombinations by which he employed his *corps d'armée*, alternately dispersing them in order to carry out operational movements and bringing them together to confront the enemy, have never been equaled. They formed the essence of the French emperor's strategic genius, even to the point where, by "inventing" strategy, he was able to overrun almost the whole of Europe in a short period of no more than a few

years.¹ Nevertheless, it should not be forgotten that few commanders of any time or place have fought as many great battles—*batailles rangées*—as did Napoléon. He himself in his memoirs boasted of having commanded in 60 battles.

While the present usage of the term *operational* is generally associated with units as large as a corps, maneuver can apply to even the smallest units. An infantry squad acting independently in difficult terrain could well practice maneuver and even think operationally. An illustrious example is then-Capt Erwin Rommel's account of his actions in 1914–1918 as a platoon leader and company group commander in a mountain infantry battalion. To the extent that he based his operations less on firepower—in fact, nothing heavier than machine guns was available to him—than on movement, fluidity, leverage, and surprise, his thinking and actions clearly anticipated his subsequent actions as the “Desert Fox” commanding panzers (tanks). Curiously enough, most of the notable German panzer commanders in World War II had light infantry or scout cavalry backgrounds.

In small-unit operations, the essence of maneuver consists of “stealth and stalking.” It is a question of exploiting the terrain, maintaining cover, and jockeying for position, all the while waiting for the opportune moment to arrive. In this respect, it is much like the hunter, or jaeger. In fact, jaeger units are the source of many of the tactics practiced in maneuver warfare.

The maneuver of larger units is necessarily more difficult and surprise harder to achieve because of the size of the logistic apparatus required. In practice, it will often amount to pinning the enemy's front and attacking his flanks and rear. The British military critic B. H. Liddell Hart used to compare the process to a boxer who uses one arm to parry his opponent's punches and draw his attention while striking with the other. Gen George S. Patton, always colorful, spoke of holding him by the nose and kicking him in the pants.

When no flanks exist, artificial ones must be created. Concentration should be used, and surprise achieved, to effect an early breakthrough. The next step is to push forward while dealing with counterattacks or, better still, to prevent them altogether (a leading task of air power). It is necessary to drive wedges through the enemy forces, destroy their cohesion, carve them up into separate parts, prevent them from mounting counterattacks, and beat them in detail—if possible by cutting their lines of communication rather than by attacking their front.

For maneuver warfare to be put into practice, the first vital element is *tempo*. Tempo is not the same as speed; it has perhaps been defined best by Col John Boyd, USAF, Retired, as the observation-orientation-decision-action cycle, sometimes called OODA Loop. Fighter pilots know the concept from air-to-air combat as energy maneuverability—a concept which was also initiated in the early 1960s by then-Captain Boyd at Nellis Air Force Base (AFB), Nevada. The idea is to get “inside” the loop by transitioning from one mode of action to another before the other party can react. As this happens, the opponent progressively loses coherence in his actions. His situation is comparable to that of a chess player who is allowed to make only one move for every two made by his opponent. In ground combat, too, the idea is to move faster than the other can react and to react faster than the other can move. All this is done while aiming at fault lines in the opposing array.

The second central theme in maneuver warfare is *Schwerpunkt*, meaning focal effort at the center of gravity. It is sometimes known as hitting the enemy at the right time and place with the most force. Discerning this fault line is not always easy. The Great Captain, or military leader, has a knack for discerning it by a quick glance, or coup d’oeil, of the battle area (from the 1960s on, the situation map) with an experienced eye. Much is therefore intuitive. A good analogy is the diamond cutter’s technique of shattering a

diamond by tapping it at exactly the right place in exactly the right direction with exactly the right amount of force.

The concept of *Schwerpunkt* is sometimes confused with hitting the enemy where he is either strongest or weakest. The first will lead to a head-on clash which, provided the forces are at all equal, is likely to be both bloody and indecisive; the latter will lead to attacking into dead ends, scattering one's forces to no avail, and violating the principle of maintaining the objective.

The really artistic touch, therefore, consists of finding a spot that is both vital *and* weakly defended—a spot which, as the campaigns of the Great Captain show, *can* be found in almost any situation and under almost any circumstances. Next, that spot should be developed so as to systematically unravel the enemy's ability to react. For example, in high mountains the natural centers of gravity are represented by the widely spaced passes, since it is only by going through them that an advance is possible. However, a defender positioned on the slopes on both sides of a pass can easily make a direct attack very difficult; hence, it is necessary to outflank the defenses and take them from the rear. The objective is to trap the defenders, force them to fight while facing in the wrong direction, prevent their positions from supporting each other, overrun them one by one, and subsequently control the pass line. The defender may, of course, try to counter this maneuver by stretching his frontage on both sides. However, such an attempt will cause him to run up against the normal dilemma confronted by those who rely on a cordon defense: trying to be strong everywhere, he will end up by being weak everywhere. This dilemma is likely to be compounded by the lack of good lateral communications across the front.

Assuming the enemy to be as intelligent as ourselves, we expect him to attempt to protect his centers of gravity with all the forces at his disposal. This leads us to the third principal constituent of maneuver warfare—*surprise*. Surprise can only be based on deception. To paraphrase Sun

Tzu, it is necessary to find out the enemy's intentions while concealing one's own. One must pretend to be at point A doing B while actually being at point C doing D; being at point C, one must pretend to be at point A doing B. The purpose of all this maneuvering—which can be very complicated, time-consuming, and expensive—is to confuse the opponent, throw him off balance, and introduce an element of uncertainty into his plans. Once that is achieved, it is a question—again paraphrasing Sun Tzu—of falling on him “like a thunderbolt” with all the force that one can muster.

The fourth principal theme in maneuver warfare, and often the least understood, is *combined arms*. Combined arms is the grouping of diverse arms so that the strength of each arm is brought to the fore so as to expose an enemy weakness to another arm. An apt analogy would be the well-known children's game of the intransitive “rock-scissors-paper” circle. Here, each element in the circle is able to deal with the one coming after it while itself being vulnerable to the one preceding it. Similarly, in maneuver warfare, tanks should not be used to smash other tanks—which would merely lead to head-on clashes and attrition—but enemy artillery. Artillery is powerless against tanks; hence, it should be used to combat infantry, which, in turn, is powerless against it and if not killed will be forced to take cover. The role of infantry is to neutralize the antitank arm and that of the antitank arm is to deal with tanks.

To adduce another example of the principle in action, medieval heavy cavalry acting on its own was once the weakest of the arms; elusive light cavalry, relying on the bow for the long-distance work and on the sword or scimitar for the coup de grace, was the strongest. So long as the Crusaders relied solely on their heavily armored cavalry, they were repeatedly beaten as the Arabs would entice them to attack, allow them to exhaust themselves, and then swarm around and annihilate them piecemeal. To counter such tactics, the Crusaders themselves were forced to adopt the combined arms system, originally adapted from the

Byzantines. Infantry, armed with pikes, provided shelter for the other arms. Bow infantry caused the Arab bow cavalry to maintain a respectful distance, and the heavy cavalry waited for opportunities such as when the Arabs were pinned against terrain obstacles or tripped by concentrated bow firepower as they incautiously came too close to the Crusader formation. At that point, heavy cavalry would deliver an irresistible blow. Provided all the other components were kept well in hand, opposing light cavalry could not cope with this system, while one's own light cavalry was used as an auxiliary arm for foraging, for screening, and for filling gaps between the heavy cavalry and the main body so as to minimize the danger of being swarmed about.

The modern combined arms team likewise requires diversity. Scouts should be light, particularly in the attack. In the Wehrmacht, panzer reconnaissance units (i.e., motorcycle troops) were the elite within an elite. Light and heavy infantry are required to complement the tank. The antitank component is a distinct arm of its own. Tanks are for attacking/exploiting in the offense and counterattacking in the defense. The value of combined arms is obtained from the coordination of their diversity, not in the sum of their firepower scores.

Because tempo, surprise, and combined arms all mean the rapid adaptation of available resources to a fleeting situation, the fifth cardinal element of maneuver warfare is *flexibility*. Flexibility is an ideal that everybody recognizes; less recognizable, however, are the ways in which it is achieved. To be flexible, a military organization must be well rounded, self-contained, and not too specialized. It must discourage excessive standardization of component parts and allow redundancy (which permits the organization to absorb hits without impairing its ability to function) and even allow some waste. Even when all these structural elements are in place, the only factor that can guarantee flexibility is training and still more training. While exercises designed to

ensure that smooth cooperation of all the different elements are very important, they in themselves are not enough. Rather, it is necessary to pit oneself against an active, reactive opponent (i.e., to use war games of every sort).

Finally, the sixth cardinal element of maneuver warfare is a *decentralized command* that will permit flexibility. In a rapidly moving, fluid battle or campaign, even the best available communications system is unlikely to keep up with the movement of forces. The amount of personnel, equipment, procedures, and information needed to keep up may well be so great as to cause clogging and thus impede movement. The only way out of this dilemma is to rely on a properly designed, properly rehearsed distribution of the responsibility among the various command echelons. Lower levels must be granted both the right and the means to exercise their own initiative, adapt themselves to the situation, and seize the opportune moment. In maneuver warfare, units and commanders who merely follow orders—let alone wait for them—are useless. The whole point, on the contrary, is to make use of the “total independent commitment”—as the Wehrmacht’s regulations used to put it—of the troops from the lowliest private up.

If troops are to use their own initiative, they must be given insight into the army’s objectives at one level, or possibly even two, above their own. In other words, they should be given mission-type orders that, in addition to describing such matters as the overall situation, available enemy intelligence, means to be used, assembly places, demarcation lines, and jumping-off times, will explain the *purpose* of each operation and the way in which it fits into the plans of higher headquarters. Orders of this kind will have the additional advantage of acting as a safeguard against anarchy; however, they are not enough in themselves. To carry out maneuver warfare effectively, commanders at every level should have at their disposal means for monitoring their subordinates that will be independent of those subordinates’ own reports—or, using a term first coined by

this author, a *directed telescope*. Most likely the telescope will consist of specialized personnel (e.g., Patton's "Household Cavalry") and equipment. Its exact nature will depend on the situation as well as the available means.

Americans tend to find maneuver warfare counter-intuitive. This may be because US armed forces since the Civil War have had a long tradition of fighting from a position of overwhelming material strength. For them, war has often been a question of maximizing the blows that they could deliver on the basis of available resources, then exchanging blow for blow until the weaker side—almost always the enemy—was attrited to the point of being no longer combat capable. On top of this problem has come linguistic confusion. As we saw, modern US Army maneuver doctrine was deliberately modeled on the German precedent. Nevertheless, even the best available translations cannot render the exact meaning of the original language; in turn, American terms often differ subtly from British ones. For example, the very title of German keystone manual HdV100/100 VS-Nfd, *Fuehrung im Gefecht*, can be variously translated either as "Command and Control in Battle" or as "Leadership in Combat." In the past, this and similar problems have caused great confusion. Even after a decade of explicit acceptance of German maneuver precepts, the US Army's *AirLand Battle—Future (Heavy) 2004* (January 1989), while couched in maneuver terms, was arguably a halfway house between maneuver and attrition. The latest US Marine Corps manuals (e.g., Fleet Marine Forces Manual [FMFM] 1-3, *Tactics*) and the US Army's recent concepts about the nonlinear battle do better at capturing the German meaning.

At any one time, attrition warfare will have most units on-line. These are organized homogenously based on the belief that a chain is no stronger than its weakest link. Operational reserves are small to nonexistent. Correspondingly, there are few divisions that can be rotated on- and off-line to rest combat units and to integrate and train

replacements. Maneuver warfare, by contrast, will usually screen the front and have only a minority of all the troops in action; the majority will be held ready in reserve so they can not only engage in training and reorganization but prepare to operate on a surge basis. Units are heterogenous in quality with the best units leading the attack and the remainder following and consolidating the gains.

Attrition war is linearly oriented, with units packed closely together and with flanks tied in tightly. Maneuver war is thrust-line oriented, with wide, and often unequal and variable gaps between attacking thrusts. Gaps are seen as setting up opportunities. Thus, there is an orthogonal (right-angle) relationship between attrition and maneuver warfare. Attrition seeks to smash the enemy assets one by one until few or none are left. Maneuver seeks to break up the various kinds of glue (logistic flows, command and control, the capability for coordination and mutual reinforcement) that bind them together even to the point where they will no longer be able to put up a coherent resistance. Attrition warfare takes aim at the enemy's strengths; maneuver warfare, at his weaknesses.² Regardless of the size of the engagement, attrition focuses on the immediate battlefield and often results in massive bloodshed. Maneuver seeks to avoid both the battlefield and the bloodshed by moving to the next highest operational level; in other words, it seeks to decide the tactical engagement by using grand tactics, the grand tactical engagement by using operational art, and the operational-sized engagement by resorting to strategy. This, of course, is another reason why such warfare requires commanders to be trained to think at least one level of war (preferably two) higher than the one in which they themselves are operating.

Acting on the defense, attrition warfare puts the bulk of its forces well forward while attempting to create and hold long, continuous fronts covered by natural obstacles that serve to slow and stop the enemy so he can be destroyed by firepower. By contrast, an army engaging in maneuver

warfare will only screen its front, and that front may well have gaps deliberately built into it. Obstacles serve purely to deflect the enemy thrust so as to set up counterattacks. Attrition warfare avoids linear obstacles because they inhibit counterattacks. Meanwhile, the bulk of the forces are held back far enough to put them out of harm's way; subjected to an attack, a maneuver-oriented army will first give way and then, after the attacker has exposed his flanks and possibly overextended himself, rely on a swift, sharp counterattack carried out without waiting for orders from the next highest command echelon. In attrition warfare, attack and defense will be sharply differentiated, whereas in maneuver warfare the difference will be much smaller because both will consist of the interplay of thrusts and counterthrusts.

The terms *defense* and *front* raise the issue of force-to-space ratios, which for many years have been a salient factor in arms control and in studies purporting to measure the military balance in Europe.³ Since the units are static and the firepower that weapons can bring to bear limited, attrition warfare always demands a defensive "minimal" regardless of the opponent's strength.⁴ Otherwise, gaps will appear and flanks cannot be tied in. By contrast, maneuver warfare is fluid by definition. Hence, not only can it make do with much lower force-to-space ratios but may actually relish them. A defense acting in such a way may well hold its own against an attacker outnumbering it by three to one and even more. There were many instances of this kind on the Eastern Front in 1943–45, whereas the best example of all is arguably the one presented by the Israeli defense of the Golan Heights in 1973.

To understand the nature of the advantage enjoyed by the maneuver-based defense, it is perhaps most convenient to follow Carl von Clausewitz. By his logic, the tactical defense enjoys three cardinal advantages: surprise, the benefit of the terrain, and concentric attack.⁵ Surprise favors the defender because, unlike the attacker whose moves must take place

in the open, he can mask both his positions and the movements that take place behind them. Terrain favors the defender because he can furnish it with all kinds of obstacles, although it should be explicitly noted that, to Clausewitz, the value of such obstacles consists less of their own inherent strength than of the possibilities they offer for using the unexpected to confront an attacker who tries to move through them. Finally, though the attacker may be in a better position than the defender to envelop the opponent's entire force, the defender is better able to launch concentric attacks against parts, or segments, of the enemy force that have broken through and thus have detached themselves from logistic support as well as control from the rear. Note that all three advantages will accrue to the defender only in case he is mobile or at least retains an operational reserve (in other words, the extent to which he engages in maneuver warfare).⁶

In attrition warfare, the defense relies on the strength of its prepared positions and confronts the attack head on. In a maneuver defense, the basic tactic from which all variations are run is the side step, like that of the bullfighting matador. This is as true for light infantry in mountains as it is for heavy armor in flat terrain. The German "room defense" tactic provides for a series of side-stepping maneuvers at each command level from company to corps and reaches to a considerable depth. Shoulders and sides of the penetrated area are held. Flanking units are usually not withdrawn (i.e., they are not taken back to phase lines parallel to the front). The depth to which the enemy is permitted to penetrate depends on his strength and availability of reserves, as well as the nature of the defended area and political considerations. On the Eastern Front in World War II, there were at least two cases when depths reached 100–200 kilometers—Operation Blau (Blue) in May 1942 and Field Marshal Erich von Manstein's counter-offensive in the Ukraine early in 1943. In the North Atlantic Treaty Organization (NATO), the Germans used to have a

declaratory posture of a rigid defense on German soil until an enemy thrust reached about 40 kilometers (km). This provided time to bring up operational reserves and to stretch out and overextend an attacking thrust in preparation for a counterstroke against weak, elongated flanks as well as against any isolated attacking units that might have broken through. In many ways, this is the old Cannae model that has so permeated German military thinking since the Battle of Sedan in 1870.

Attrition and maneuver also differ in the way weapons are employed. The former uses them in order to destroy as many targets as possible as rapidly as possible; the latter uses them to bring about specific tactical situations considered favorable by the commander. To continue the NATO defensive reasoning as explained in the last paragraph, the Germans planned to use multiple launch rocket systems (MLRS) to canalize the attacker's movements even before he reached one's own forward edge of the battle area (FEBA). Thus, the "canal" in which he moved would be made deeper, with a corresponding reduction of the depth to which he would be allowed to penetrate into friendly territory. By such means the attacker's freedom of movement would be reduced. As soon as the direction of the enemy thrust became known, the side stepping would begin and other sectors could be denuded of troops who would be free to counterattack. All this, to repeat, is possible only provided the defender subscribes to maneuver warfare. Attempting to practice attrition against a superior opponent, he probably would not be able to counter the attacker's *Schwerpunkt* in time and, consequently, would lose at least the battle or at most the war.

Logistically speaking, a major advantage of maneuver warfare—and one that has important implications for air power—is that armed forces so oriented require significantly less support than do positionally oriented ones tending towards attrition. This phenomenon is manifest in comparative teeth-to-tail ratios. In World War II, the German army had

total army divisional slices of approximately 31,000 men. Soviet ones were leaner still. Meanwhile, those of the American, British, and Canadian divisional slices exceeded 64,000.

Moreover, the German and Soviet armies fought a protracted conflict over vast areas largely devoid of a modern infrastructure. Their troops, particularly Soviet ones, may have had to do without some of the comforts available to the Western Allies; yet on the battlefield, these troops, the infantrymen in particular, were much more liberally supplied with the things that mattered (i.e., automatic weapons). At a time when American GIs were still toting their single-shot M-1s (and British Tommies their World War I Lee-Enfields), the Germans had introduced the *Sturmgewehr* and the Soviets the *avtomat kalasnikova* (AK). Furthermore, the German and Soviet armies, unlike the US Army, were liberally equipped with mortars and light machine guns. And by utilizing the organizational device of artillery divisions, the Soviet General Staff (*Stavka*) ensured that there would be more artillery support available at the decisive moment—that is, during breakthrough operations. Correspondingly, German and Soviet divisional subunits had less organic support built into their tables of organization and equipment (TOE) and less corps and army-level support than did the American, British, and Canadian armies.

Historians have sought to explain this divergence in teeth-to-tail ratios by reference to protracted war and living off the land. The first of these arguments assumes that a protracted war requires more maintenance and sustaining support than does a short one, when in fact it is more the result of an army's doctrinal style and the organization devised to support that style. The second argument misrepresents the nature of modern warfare. It is true that both the German and Soviet armies stripped the countries through which they passed. Engaging in widespread and systematic robbery, the Wehrmacht in Russia was even able

to procure some 50 percent of its food supply on the spot. However, this only went so far in meeting the logistic requirements, given that these requirements consisted very largely not of food and fodder but of ammunition; petroleum, oil, and lubricants (POL); and spare parts.

It is, of course, true that Soviet and German forces were much less motorized than Western ones, relying as they did on railways on the one hand and horse-drawn transport on the other. Still, this cannot explain the fact that a German panzer division operating in the Western Desert required only 300 tons of supplies a day to remain fully operational as compared to 600–650 tons for an American armored division in France in 1944–45.⁷ Rather, the real answer seems to lie in (1) the use of artillery, (2) the tempo of operations, and (3) the organization.

Linear armies attack and advance ponderously across the front. Since there is little significant weighting of the attack, artillery and close air support play major roles in facilitating the advance of tanks and infantry. In contrast, maneuver armies attack along narrow, highly focused sectors. These sectors receive overwhelming priority in allocation of firepower support whereas other sectors only receive a pittance and are to do little more than “demonstrate” to their front. Moreover, even in the attack, maneuver armies do not use artillery until the last moment so as to avoid telegraphing intentions ahead of time. When it is used, artillery fire is sharp and intense with the purpose of stunning the enemy rather than killing him. All this means that, for the campaign as a whole, tonnage requirements are much less. The same applies to the quantities of transport and engineering, as well as to the support and maintenance services that these functions themselves require.

Tempo sharply reduces casualties and logistic demands. This is the logical result of maneuver impacting the enemy before he can react coherently. The Soviets in their detailed postbattle studies (table 1) made elaborate correlations demonstrating this phenomenon. Their data show that, in

addition to reduced demands for ammunition and fuel, fast-breaking advances of 20–50 kilometers a day resulted in three times less personnel losses and 1.5 times less tank losses than when the tempo of advance was 4–10 kilometers per day.⁸

Table 1

**Expenditure of Tank Armies
per 100 Kilometers of Advance**

(Experience of the Great Patriotic War)

Forms of Expenditure	Rate of 16–45 km/day	Rate of 4.5–13 km/day
Expenditure of ammunition units of fire	0.25	1.5
Expenditure of diesel fuel for T-34 Tank	0.7	2.0

Source: V. Y. Savkin, *The Basic Principles of Operational Art and Tactics (A Soviet View)*, trans. and published under the auspices of the USAF (Washington, D.C.: Government Printing Office, 1972), 137.

Finally, the implications of tempo and use of artillery are reflected in the manner by which maneuver armies are organized. Attrition armies are organized with relatively few divisions. In World War II, the US Army had but 89 divisions and the US Marine Corps (USMC) only six, even though the overall size of US ground forces was as large as that of the German and Soviet armies, which had many times more divisions. American divisions were organized to remain on-line in the attack and defense for prolonged periods; German and Soviet divisions were not. Because they were designed for prolonged combat, American divisions and corps had organic, built-in logistics for conducting the attack and defense. They were not designed for agility and high-tempo operations. Nor, given their small number with most of them on line, was there much opportunity for differentiation in the amount of logistic support organic to and in support of these divisions. Thus, in table 2, we see that while soldiers eat the same wherever they may be on the battlefield, their use of ammunition, fuel, and spares

varies as much as 13:1 for ammunition, 6:1 for fuel, and 3:1 for spares according to their division's task in the battle. Maneuver armies recognize and capitalize on this phenomenon. Attrition armies do not and cannot. Today's US Army and USMC espouse maneuver doctrine; however, their organizational practice remains premised on attrition style warfare.

Another facet of supply for maneuver warfare is that forward, adjacent, and reserve divisions and corps must have common logistics though not necessarily common weapons. The NATO principle that logistical provision is a national responsibility becomes inoperable with adoption of the alliance's new operational concept of counterconcentration. National provision has always caused commanders heartburn; still, it may have been workable as long as nations fought along a cordon in well-defined sectors and breaks in the defense chain were supposed to trigger nuclear

Table 2

Divisional Estimated Requirement Rates Daily (Tons)

	Heavily Opposed or Major Axis		Lightly Opposed or Minor Axis		Average		Totals Maximum
	AMMO	FUEL	AMMO	FUEL	RATIONS	SPARES	Minimum
	MR ^a /Tk ^b	MR/Tk	MR/Tk	MR/Tk	MR/Tk	MR/Tk	MR/Tk
Break-through	520/480	700/610	280/260	400/370	30/28	120/85	<u>1370/1200</u> 830/740
Defense	580/520	320/300	370/330	200/180	30/28	80/50	<u>1010/900</u> 680/590
Pursuit	66/63	900/810	44/40	590/550	30/28	60/40	<u>1055/940</u> 730/660
Reserve	140/120	230/200	88/80	160/140	30/28	35/25	<u>435/375</u> 315/275

Source: Royal Military Academy, *The Sustainability of the Soviet Army in Battle* (Sandhurst, Eng., Soviet Studies Research Centre, September 1986), 23. (This study and its annexes have many useful charts and monographs relating to Soviet operations, artillery suppression, and logistical support.)

a = Motorized Rifle Division
b = Tank Division

responses. Over the years, though, the latter lost its credibility. NATO's operational brittleness and its inability to assist collapsing corps by reinforcing or counterattacking were the principal reasons why the alliance was so militarily weak even though its overall firepower scores compared favorably with those of the Warsaw Pact. Among NATO's corps, only the three interspersed German corps had a cross-corps capability because they could tap the assets of the German Territorial Army. All other corps were tethered to their own sectors because of the need to accompany counterattacking columns with cumbersome, nationally dedicated logistical trains.

As of the last decade of the twentieth century, NATO's new force structure blueprint and operational concept are incompatible with its existing mode of logistic provision. Structuring by multinational corps compounds the difficulties. Maneuver is not possible if numerous different national "umbilical cords of supply" are twisting around each other as their combat heads attempt to jostle for advantage against a maneuvering opponent in a low force-to-space setting. And even if this twisting, tangled mess could be sorted out somehow, maneuver would still be inhibited by unnecessarily clogged roads as logistic trains trail long behind national divisions. Maneuver must be consummated before the enemy can coherently react; if this is not done, then maneuver becomes mere movement.

The solution to NATO's present problem is apparent. Logistic support within divisions is highly integrated, penny packeted, and difficult to change. However, the same is not true for logistic arrangements above division.

Except for personnel and equipment for specific units like medical and weapons system maintenance, most corps support units need not be present in peacetime and can be provided by host-nation support in wartime.

For any European-based multinational corps trying to wage maneuver warfare, changing the existing system of logistic support is an operational imperative. Such an approach

would also ease three of the most pressing concerns in basing US troops in Europe—costs, equitable burden sharing, and local community interest in maintaining military bases. Centralizing logistics in this manner would allow a 25 percent reduction in US Army peacetime personnel strength. Most logistic tasks can be accomplished by assigning them to in-place divisional support commands for normal peacetime demands and by local contracting for peak peacetime demands (and training and familiarization for wartime tasking under the auspices of German regional commands, formerly termed *Territorial Army*).

Now to the other side of the logistic equation, namely denying supplies to the enemy. It is evident that for linearly deployed, attrition-oriented ground forces to achieve victory by strangulation is impossible. They are designed for pushing the enemy back and generally lack the agility for piercing his front and pinching off large formations. Experience in Italy (1943–45), Korea (1950–53), and Vietnam (1965–73) also shows that it is almost equally difficult for a land air force to reduce the enemy's logistic support to the point where he is no longer able to resist. By contrast, maneuver-oriented forces will have many opportunities to act against the other side's lines of communications (LOC). Advancing into the enemy's rear even though his front is still intact, they will be in a position to overrun bases, tear up railroads, block roads, and intercept convoys of every kind. This capability can be seen clearly in the history of every war of maneuver from France in 1940 through Suez in 1973 to the Gulf in 1991. Air power fits into this formulation by supporting maneuver. Without air, maneuver cannot be consummated; and air, by inhibiting enemy maneuver, facilitates one's own maneuver. Air itself accomplishes little in attacking supplies and LOCs. If the enemy's supplies—particularly fuel, which is most readily interchangeable—can be captured through high rates of advance rather than destroyed, so much the better; again, there are many examples of this in the history of war

during the last few decades.⁹ Furthermore, in war the effect of morale to material forces is as three to one. Nothing is more demoralizing to troops than to learn of the presence of an enemy to their rear. As a result, they will often be beaten long before their supplies actually run out.

To those who are unfamiliar with its basic concepts, maneuver warfare often looks like some kind of esoteric magic whose objective is to obtain something for nothing. In fact, it is nothing of the kind; rather, following ideas familiar to all great commanders (though most clearly expressed by the Chinese writer Sun Tzu), it is based on the way we perceive the enemy and, by implication, the nature of our duel with him. Its starting premise is that the enemy resembles us. Therefore, he needs to be approached not as an assembly of "targets" to be destroyed one by one but as a living, intelligent entity capable of acting and reacting. Simple as that idea may be, we have seen how, in the field of operations and logistics alike, this way of looking at the enemy leads to concepts and methods that are radically different from those of attrition warfare and, in some cases, counterintuitive. Having explored the nature of the beast, we shall take a more detailed look in the following chapters at the way air power has been used to support and, in some cases, decide war.

Notes

1. David G. Chandler, *The Campaigns of Napoleon* (New York: Macmillan, 1966), pt. 4.

2. Under the German system, this was known as *Flachen-und-Luecken Taktik* (literally "surface-and-hole tactics").

3. For an excellent comparative analysis of the so-called bean count models on their own terms, see Natalie J. Goldring, *The Conventional Balance: How Far beyond the Bean Count Are We?* a report of the Defense Budget Project (Washington, D.C.: The Project, June 1989). All these models unwittingly premise the attrition approach to war, as do virtually all Lanchester and quantitative models.

4. See B. H. Liddell Hart, "The Ratio of Forces to Space," in *Europe, Deterrent or Defense*, ed. B. H. Liddell Hart (New York: Praeger, 1960), 94-109.

5. Carl von Clausewitz, *On War*, ed. Michael Howard and Peter Paret (Princeton, N.J.: Princeton University Press, 1976), bk. 6, chap. 2.

6. Clausewitz's reasoning leads to the paradoxical conclusion that whereas the defender has the advantage in flatlands, in mountains the advantage lies with the attacker. This is because there will be no opportunity in broken terrain for the defender to carry out concentric attacks. For a similar contemporary German view, see Lt Gen Hans-Henning von Sandrart, "Forward Defence: Mobility and the Use of Barriers," in *NATO's Sixteen Nations*, no. 1/85: 41-43. The German meaning of mobile defense is not synonymous with the American meaning. "Fluid" for "mobile" gives a more accurate rendering. Period papers from General von Sandrart's immediate successors as army chief (Generals von Ondarza and Naumann) exhibit similar thinking.

7. Martin van Creveld, *Supplying War: Logistics from Wallenstein to Patton* (London: Cambridge University Press, 1978), chap. 5 and 7.

8. V. Y. Savkin, *The Basic Principles of Operational Art and Tactics: (A Soviet View)*, trans. and published under the auspices of the USAF (Washington, D.C.: Government Printing Office, 1974), 136.

9. German general Erwin G. Rommel at Tobruk in May 1942 captured sufficient fuel to carry him to El Alamein; conversely, the failure of the Germans to capture a million gallons of American fuel during the Ardennes offensive in 1944 played a critical role in their failure.

Chapter 2

Maneuver Warfare in Action

Early German Campaigns

This chapter first outlines the background of the German system of “operational” warfare. Next, it examines how the Luftwaffe was built in conformity with this system and tested during the Spanish Civil War and the Polish campaign of 1939. Finally, it shows how the Luftwaffe fit into the French campaign of 1940, where it achieved its greatest triumph.

The key thought on which everything depends is Clausewitz’s view that a country’s strength consists in its armed forces; therefore, the great goal to strive for is the defeat of the enemy’s armed forces.¹ Such a doctrine, seeking to end the war by a quick decision, was well suited to the status of Prussia, the smallest of the five great powers until the second half of the nineteenth century. It continued to dominate German intellectual preparation for the two world wars. Looking backward, we tend to see Germany as a colossus that twice made a bid for global domination and almost succeeded in its attempts. That, however, was not the way the Germans saw themselves. With national unification coming very late, they thought of Germany as continuing to be a relatively small, poor country. In their minds, moreover, it was a nation that had the misfortune of being located in the center of Europe and was therefore constantly threatened by the surrounding powers whose combined demographic, economic, and military resources were greater than its own.

Still following Clausewitz (in fact, admitting that Clausewitz was the greatest single influence on his military thought),² Helmuth von Moltke (1800–1891), chief of the German General Staff, believed that to defeat the armed forces of the enemy it was necessary to confront him in

battle. However, the resources of the modern state were so great and its territory so large that not even the largest frontal battle could be expected to lead to decisive results. Even if the battle were won, the outcome would merely be to push the opponent back along his line of communications until he came to some other position, usually a river or a defile at which to make a fresh stand. As the invader advances, his numbers diminish due to the need to leave garrisons and occupy the country. As the victor moves farther and farther away from his bases of supply, the defeated party falls back on his own. According to the doctrine of the "culminating point," the winner might even end up by finding himself in a worse situation than at the beginning. In essence, the problem consists not so much of gaining a battle as turning a victory into a decisive one by preventing the enemy from making good his retreat.

Thus, the use of space and time in order to bring about not just a battle but a decisive battle stood at the heart of the German method of making war. In modern English, the system of movements that this involves is known as maneuver; the Germans themselves called it *operieren*. This is not to say that it was original with them. Like everybody else, they received the idea of war as a series of operations directed into the enemy's rear from Napoléon by way of Antoine Jomini and Clausewitz and, after them, a whole bevy of lesser luminaries. As even a superficial reading of the literature will confirm, Napoléon was in many ways the grand master against whom everybody else measured himself. His example continued to dominate military thought throughout the nineteenth century and right up to World War I.

This operational doctrine was put to the test for the first time in the wars of 1866 and 1870–71. In both campaigns, the Prussian/German field armies, making use of the railways and being controlled by telegraph, deployed along what were, by contemporary European standards, extremely broad fronts. Organized in massive groupings that

numbered over 100,000 men each, they entered the enemy's country from two or three different directions at once. Although operating independently of each other, they were still able to carry out a series of coordinated maneuvers designed to bring them onto the enemy's flank and rear. There were great German victories at Koenniggraetz and Sedan when these forces came together to crush the enemy. As Moltke himself was later to explain to historian Heinrich von Treitschke, this kind of concentric operation represented "the highest that strategy could achieve."³

The purpose of the German doctrine was to achieve quick and total victory by encircling the enemy. Hence it was known as *Kesselschlacht*, literally "pot battle" (perhaps in memory of the French general who, finding himself surrounded at Sedan in 1870, said that "*nous sommes dans un pot de chambre et nous y serrons emerdees*"). A quarter century after it had first been put into practice, the doctrine was given incomparably brilliant theoretical formulation by one of Moltke's successors as chief of the General Staff, Graf Alfred von Schlieffen. Von Schlieffen explained in his *Cannae Studien* that from the time of Hannibal, maneuvering against the enemy's flank and rear in order to sever his communications had always been the one decisive move in war, whereas everything else merely led to "ordinary" victories.⁴

When the Germans went to war in 1914, they hoped to achieve a quick decision by going around the enemy and maneuvering their forces against his flank and rear. This time, however, their maneuver was planned on a gigantic scale and designed to cover not just a few frontier provinces but an entire country. In actuality, these plans proved too ambitious. While the size of armies had increased tenfold since 1870, there had been no corresponding revolutionary developments either in transport or in command and control.⁵ This meant that both sides, but the Germans in particular, still depended mainly on rails and horses for the former and on wires for the latter. The advance, which

aimed at nothing less than taking the French armies in the rear and crushing them against their own border fortifications, faltered and ran out of control before being brought to a halt at the Battle of the Marne.⁶ The inconclusive race to the sea that followed proved that, in the kind of mobility that formed the keystone of the operational style of war, the Germans possessed little or no real advantage over their opponents.

The struggle of attrition that developed from late 1914 on was in many ways the opposite of the German style of war and just what it had always sought to avoid. Paradoxically, however, that very stalemate was of great assistance in the development of air power and, specifically, air-to-ground cooperation. When the war broke out, air power was in its infancy. Its only previous use had been by the Italians, who, when fighting the Senussi in Libya, relied on aeroplanes to track their nomadic enemies and toss the occasional grenade at them.⁷ No country as yet possessed an independent air force (US aircraft were assigned to the Signal Corps), and the method commonly used was to distribute the few available planes to armies and corps, which employed them for reconnaissance purposes. When war broke out, encounters between reconnaissance aircraft on both sides soon led to pilots using carbines and pistols to take potshots at each other. Both sides quickly saw the need to protect their reconnaissance machines with specialized fighters, and so air-to-air combat was born.

By 1916 the air squadrons of both sides—it being too early to speak of air forces—were carrying out many of the types of missions later associated with air power. In addition to reconnaissance and air-to-air combat, these missions included observation for artillery; attacks on enemy positions with grenades, light bombs, and machine guns; interdiction of ground forces; and attacks on airfields, lines of communications, supply dumps, and military installations of every kind behind the front.⁸ By the end of the war, both sides had added strategic bombing aimed at the enemy's

civilian war industries, transportation networks, and centers of population to their repertoire. However, the scale on which the last-named type of missions were carried out was minuscule, proving to be almost irrelevant to the outcome of the conflict.

Air-to-air combat and strategic bombing constitute independent missions that can be carried out even in the absence of good air-to-ground and ground-to-air communications. However, if air power is to be of assistance to armies in the field, it is critical that good communications be established between them. In fact, though a few aircraft were equipped with primitive radios beginning in 1918, no such communications were available to any belligerent during World War I. Pilots had to make do with improvised devices. They tried to communicate with the ground by wagging their wings, giving blasts on horns, writing out messages on pieces of paper that were then wrapped around weights or put into containers and dropped overboard. Conversely, ground troops who wanted to communicate with friendly aircraft or simply to make sure that their own positions would not be bombed or strafed by them had to rely on pieces of colored cloth, smoke, and flare signals fired from Very pistols.⁹

The stationary nature of the war made it easier to use such primitive communications for air-to-ground cooperation. Except in darkness or when the weather was bad, the massive trench systems bisecting the countryside to a depth of several miles on each side constituted the best possible means of identifying the location of one's own troops and that of the enemy. This made it relatively easy for pilots to avoid attacks on friendly forces. Also, since the absence of operational freedom meant that the vast majority of large-scale moves on both sides were purely frontal, there was normally no clear center of gravity or decisive point. Under such circumstances, the decision as to which enemy forces to attack and when and where to attack them was less an operational problem than a technical and tactical one. In

other words, what support air power could give to ground forces was made possible precisely by the fact that the war was, for the most part, not fluid but rigid. Conversely, if air power was to be effectively used in the kind of operational war beloved by the Germans, then a lot would depend on devising better technical means for air-to-ground and ground-to-air communications—a point that was not wasted on the air force commanders of the time.¹⁰

Stalemate at the front also had the effect of shifting the main burden to each country's demographic-economic-industrial basis. In this competition, the Germans were confronted by the combined resources of almost the entire world and were, as they had always feared, unable to match their enemies in the long run. Much of their conduct of the war can therefore be seen as a series of attempts to break the deadlock and restore operational freedom, first in the east and then—having gained the upper hand there—in the west. As the ultimate failure of the great 1918 offensives showed, the technical means that would enable logistic support to follow on the heels of rapidly advancing assault troops and the troops themselves to be commanded by rear headquarters were just not available.¹¹

In the end, operational success eluded the Germans. Still, their ability to punch holes through the Allied trench systems was demonstrated time and again, thus showing that they were at least tactically on the right track.

Following these events, German military thought between the world wars revolved almost entirely around the problem of restoring operational freedom and, with it, the kind of war they favored and in which they were supposed to excel. The ideal of the *Kesselschlacht* remained unaltered; the question was how to gain the freedom of movement necessary for carrying it out. The conventional solution, repeatedly advocated by Chief of Staff Hans von Seeckt during the early twenties, was to rely on highly trained infantry forces employing 1918-style infiltration tactics on a larger scale while taking advantage of every kind of modern weapon,

including the air force.¹² This was never very convincing, and during the thirties a group of younger officers began to look at “fast forces” (*schnelle Truppen*) as the solution to restoring mobility and thus allowing maneuvers aimed at the enemy’s flank and rear.¹³ The debate had by no means been resolved when war broke out in 1939. Some five-sixths of the Wehrmacht’s entire order of battle still consisted of infantry divisions; and there were many military leaders, beginning with Gen Ludwig Beck, the chief of the Army General Staff (resigned March 1938), who doubted whether it could be done at all.

During this period, the Germans, with the significant exception of Gen Erich von Ludendorff of World War I fame,¹⁴ also continued to regard war primarily as a question of one armed force fighting another. Along with everybody else, they tended to exaggerate the extent of the damage that strategic bombardment could inflict; war games conducted by the Army General Staff during the mid-1930s proceeded on the assumption that within a few days of the beginning of hostilities, a dozen or so German border towns would be in flames.¹⁵ However, with some exceptions,¹⁶ they did not accept the theories of Gen Giulio Douhet, Alexander de Seversky, and others.¹⁷ Douhet had sought to shift the focus of hostilities away from the armed forces; instead of devising better ways in which they could fight and defeat each other, he hoped to make their struggle unnecessary by going after the civilian population instead. His approach did not commend itself to the Germans both because they claimed to have the best armed forces of all and because they believed, correctly as it turned out, that strategic bombardment, even if ultimately successful, would require a long-term massive effort that they could ill afford.¹⁸ Instead, their work during the entire period was aimed at finding better ways in which air power might assist the ground forces and thus help them achieve an operational victory.

When Hitler began rebuilding the Luftwaffe during the mid-1930s, these ideas were reflected in its first operations

manual (1935).¹⁹ Entitled *Die Luftkriegfuehrung*—literally, “The Conduct of Air Warfare”—the manual was signed by the first chief of staff of the Luftwaffe, Gen Walther Wever. It opened by reasserting the traditional German belief that the enemy’s center of gravity lay in his armed forces and that those forces could only be defeated by the combined action of all three services.²⁰ The first mission of the Luftwaffe, overriding all others, was to gain air superiority either by attacks on the enemy airfields or by air-to-air combat.²¹ Next, the manual cut across our current distinctions between the tactical and the strategic; instead, it put the emphasis on the *operativ* by which Wever, using standard German terminology, meant the maneuvers of large units from division to army group size. Air power was to contribute to victory by attacking *military* objectives that were quite broadly defined.²² On the other hand, attacks having as their sole objective the terrorization of the enemy civilian population were explicitly forbidden as being both counterproductive and contrary to the law of war.

The Luftwaffe’s operations in support of the land forces were divided into *unmittelbar* (“direct”) and *mittelbar* (“indirect”). *Unmittelbare Unterstuetzung*, literally “direct support,” which Wever and a majority of officers considered to be of lesser importance, stood for what we today would call direct battlefield support. Besides reconnaissance and artillery observation, it included both bombing and strafing. *Mittelbare Unterstuetzung* carried connotations of maneuver, leverage, and choke points. It stood for operational warfare behind the front, including strikes at lines of communications, supply bases, and reserves as well as missions against “the sources of the enemy’s strength” (*Kraftquellen*) such as armament factories; however, as already explained, it excluded the bombardment of the civilian population.²³ All this was very much in line with Clausewitz, Moltke, Schlieffen, and even the rather less well-developed ideas of Seeckt.²⁴ On the other hand, it rejected both those who envisaged modern war as a “total” struggle of attrition

between entire social systems and the more rabid advocates of strategic air power who hoped that aircraft would be able to win wars all on their own.²⁵

The first opportunity the Germans had to put their rediscovered operational doctrine to the test was in Spain. Following the outbreak of the Spanish Civil War in July 1936, the Luftwaffe dispatched nine Ju-52 transport aircraft that played a critical role in bringing Gen Francisco Franco's forces over from Africa to the homeland. Subsequently, the Condor Legion, commanded by Gen Hugo Sperrle with Col Wolfram von Richthofen acting as chief of staff, was expanded. At its peak, it was comprised of about 5,000 men and 100–150 aircraft, including liaison and reconnaissance machines, ground-attack aircraft, fighters, light bombers, and transports (Ju-52s) that were occasionally able to double as bombers. This organization never exceeded more than one-third of all the air forces fighting on Franco's side, including both Spanish and Italian. The German contribution in ground troops was nil.

If the Germans had hoped to make Spain into a showcase of modern *operativ* warfare, they were disappointed. Spain, by virtue of its geography, was not a single theater of war but several. The various provinces are separated by mountain chains. They have a markedly dissimilar character and are often linked solely by a handful of roads that twist and wind their way through high passes. During wintertime some of the passes are usually blocked by snow. Much of the terrain is very broken and rugged, offering little scope for sweeping operations by large mechanized forces even if such forces had been available to either side. Both the nature of the terrain and the fact that this was, after all, one of the poorest countries in Europe meant that many, perhaps most, supplies had to be carried in horse-drawn wagons or even on the backs of pack animals. The commanders of the Condor Legion, trying to establish their forward headquarters at places where they could observe the action, routinely relied on horses.²⁶

Besides, this was not simply a trinitarian conflict between the armies of two opposing states. Instead, it was a many-fronted civil struggle in which *operativ* warfare—drawing arrows on a map, cutting lines of communication, overrunning bases, encircling the enemy's armed forces—counted for little. General Franco's own military experience had been gained almost entirely in colonial warfare in the Sahara. Perhaps for this reason, among others, he and his advisers put great value on guaranteeing the political security of one province before proceeding to conquer the next—*poco a poco* (stage by stage), as his deputy, Gen Emilio Mola Vidal, once put it.²⁷ The character of the struggle was such that objectives were sometimes of great symbolic value; they could not simply be bypassed, abandoned, or ignored. As a result, throughout the war, Franco repeatedly rejected his German advisers' proposals for launching bold strokes deep into the enemy's rear or for going straight toward the center of his power. Three instances come to mind.

In the summer of 1937, Franco refused to advance directly to Madrid, preferring to conquer the northwestern provinces first. In February 1938, considerations of prestige caused him to refuse to bypass the town of Teruel south of Madrid. That same summer, he refused to carry out another would-be decisive stroke, rejecting a northward move from the river Ebro into Catalonia in favor of a campaign aimed at overrunning Valencia. The German commanders of the Condor Legion suffered agony as they saw their most cherished principles of war—concentration, maneuver, the quest for the enemy's center of gravity, and the decisive battle that would quickly end the war—thrown away.²⁸ Looking back, however, one finds it hard to avoid the conclusion that they were wrong and Franco was right.

In the absence of wide-ranging, fast-moving, deep-penetrating mechanized forces and country suitable for their support, the struggle took one of two forms. In the northwest, and later during the Nationalist drive toward the

Mediterranean, it was a question of infantry fighting for the mountain approaches, often converging on a town or province from several directions at once, as during the northwestern campaign. The central plains north and south of Madrid initially saw some attempts at *operativ* warfare in the form of a Nationalist pincer movement on two sides of the capital (January–February 1937); however, this was halted and a brutal struggle of attrition took its place at Jarama and Guadalajara.²⁹ The major battle that developed on the river Ebro after the Republicans crossed it from the north in July 1938 was also one of attrition and has, indeed, been compared to Verdun.³⁰

In essence, Spain offered few opportunities for maneuver warfare if by maneuver warfare we mean the operations of armored or mechanized forces exploiting weak spots to slice through the enemy's country while aiming at objectives deep into the enemy's rear. The character of the country and of the conflict itself, as well as Spanish misgivings, all combined to prevent this.

Under such circumstances, it was perhaps inevitable that the German air operations should be prolonged and conducted in piecemeal fashion. The forces themselves did not arrive all at once. Once they arrived, strategic surprise had been lost, though tactical surprise still could be, and sometimes was, achieved. There were many attempts to gain air superiority both by striking at enemy airfields and by aerial combat. However, given the number and quality of machines on both sides (during much of the conflict, the Republicans actually outnumbered their enemies, and until the end of 1937, their Soviet-built fighters were clearly superior to the German craft), there was no possibility of gaining a rapid, overwhelming advantage in this respect. Strategic air warfare, even if it had been possible with the primitive means available, was generally rejected by Franco as contrary to Spanish national interests. He felt that Spain did not have sufficient armament factories to justify attacks on them, and, wishing to avoid escalation, he refrained from

bombing the ports.³¹ German aircraft flew numerous deep interdiction missions behind the front, “deep” here being dozens rather than hundreds of miles. They certainly hit marching columns, supply lines, depots, and military installations of every kind, particularly during the last phase when they helped interdict reinforcements trying to move from France southward through the Pyrenees. Generally, however, the dispersed nature of the conflict did not allow their operations to follow any particular pattern or to focus on any particular *Schwerpunkt* except perhaps on a purely tactical scale. The war was anything but a neat, classic blitzkrieg (lightning war), and subsequent attempts to present it as a prelude to one do not carry conviction.

There were other reasons why, from the Condor Legion’s point of view, large-scale *operativ* warfare was just not in the cards. The main fighter was the He-51, a biplane with a fixed landing gear that was completely outclassed by the Soviet-supplied I-16 Rata. Practically the only role for which the He-51 could still be used was close support. This was all the more important because the Nationalists were short of artillery and were forced to rely on air power to make up the shortage. Acting in small groups of twos and threes and rarely more than 10 or 12, legion bombers, operating with fighter support, blasted a way for the infantry through the mountain passes that led first to the northwest country and later eastward to the Mediterranean.³² Light bombers and ground-attack aircraft also took an active part in the set piece battles that developed at Jarama, Guadalajara, Brunete, Teruel, and later along the Ebro. In all these cases, close support meant just what its name implied, often to the point that aircraft, acting as flying artillery, were interchangeable with the legion’s 88-millimeter antitank guns used in the ground role. Thanks to the aircraft’s low speed and the altitudes at which they made their attacks—on occasion, as little as 50 to 200 meters—they were often able to pound enemy forces within 50 meters of friendly ones. When this naturally led to attacks on friendly forces,

the Nationalists began wearing white signs on their backs. Even so, such attacks were by no means rare.

Thus, the Germans in Spain both violated their own doctrine—which explicitly rejected the use of air power within the range of ground artillery—and found their hopes for *operativ* warfare frustrated to a large extent. However, this is not to say that they did not learn many important lessons. This was the first time since 1918 that Luftwaffe personnel had seen any action at all. Commanders, pilots, and ground crews gained experience that they, acting as instructors, were later able to pass to others. Every kind of mission was flown, including air-to-air combat for which Capt Werner Moelders developed his “four-finger” formation, which was later to be famous.³³ The nature of the ground organization needed to support air warfare was studied in depth; in 1937–38, the legion, alternating between the northwest and the country around Madrid, was already able to display the astonishing capability for the rapid redeployment of its forces that was to serve the Luftwaffe well later on. It was in Spain that Richthofen, who began by serving as the legion’s chief of staff and then took over as its commander in chief, served his apprenticeship. It was to turn him into perhaps the world’s leading exponent of close air support, an expertise demonstrated to the full in 1941 and 1942, when he was called upon to provide air support to Hitler’s Balkan campaign and to the conquest of Sevastopol. The experience gained was invaluable.

When the legion finally returned home in May 1939, the Luftwaffe found itself in a strange situation. Both its own doctrine and that of the ground forces—as embodied in the famous *Truppenfuehrung* (Forces Guidance) of 1936—continued to stress *operativ* warfare as the only one in harmony with Clausewitzian ideas and, moreover, with Germany’s own peculiar strategic situation.³⁴ However, that kind of warfare had hardly been practiced in Spain; as some Luftwaffe officers saw the problem, conditions in that

country had more to do with war in China or Ethiopia than among major European powers.³⁵ The kind of mission with which the Luftwaffe had had the most experience and which had proved most successful was close support; however, the dive-bombing aircraft considered most suitable for this mission only made up some 16 percent of its combat strength.³⁶ To make matters worse, ground-to-air and air-to-ground communications had barely advanced beyond the point where they had been at the end of World War I.³⁷ No progress whatsoever had been made in the coordination of air power with armored forces, given that tanks in Spain were only present in small numbers and, in view of the nature of the terrain and of the struggle itself, tended to be used overwhelmingly in the infantry-support role. Richthofen himself, while on maneuvers, noted that the army's generals, specifically Heinz Guderian, failed to understand either the capabilities or limitations of air power. Throughout World War II, this highly intelligent air officer was to regard the army as "unteachable."³⁸

In Poland, the German Wehrmacht was able to practice maneuver warfare for the first time and on a grand scale. Other than rivers, the terrain presented no major geographical obstacles such as those in Spain. This was an international war deliberately planned to be as brief and as decisive as possible. Hence, the objective throughout was clearly the 45-division Polish army, which was to be outmaneuvered, encircled, and destroyed if it did not surrender; only after those objectives had been achieved was Warsaw itself to be subjected to intensive bombardment and compelled to raise the white flag. The main forces entrusted with *operativ* tasks consisted of the two arms of a pincer movement (fig. 1). They struck out of East Prussia and Silesia, moving south and northeast, respectively. After a few days of border fighting, they gained operational freedom of movement and were able to create a huge *Kesselschlacht* that embraced the whole of western Poland. The main Polish forces had been left to cover the western part of the

country, a deployment dictated more by political factors than by military ones. They were bypassed and then encircled as the German forces met east of Warsaw. It was a classic in maneuver warfare, even though Poland's geographical position (the country was surrounded by German or German-controlled territory on three sides) made the victory easy.



Figure 1. The Campaign in Poland

The German penchant for *operativ* warfare was also reflected by the type of organization with which the Luftwaffe opened this, its first major campaign. In contrast to British practice, which had always drawn the fundamental distinction between fighters and bombers, the German system was not functional but geographical. The idea was to facilitate *operativ* warfare by assigning separate air commands to each major force; in this case, the army group coming from East Prussia was supported by *Luftflotte* 1 (First Air Fleet), whereas those driving north from Silesia were assisted by *Luftflotte* 4.³⁹ Each of these formations contained aircraft of all types, including liaison, reconnaissance, fighter, *Schlachtflugzeuge* (close support), dive-bomber, bomber, and transport planes. Each came complete with its own ground organization and was capable of rapid redeployment when the need arose. Not only did the Luftwaffe possess a total of 117 motorized supply columns, but Richthofen's command alone had 11 mobile airfield-construction companies attached to it.⁴⁰ In short, each *Luftflotte* was a well-rounded, balanced air force, complete in itself and capable of undertaking every sort of mission.

As Germany became subject to intensive air attack later in the war, this organization came into question. Attempts were made to remodel the Luftwaffe on the British pattern with separate commands for fighters and bombers; by then, however, the days of *operativ* warfare were long over.

The Luftwaffe's record in Poland was mixed. It opened the campaign with a surprise blow at dawn 1 September 1939, the first time in which any country had employed this tactic that was later to become standard in the hands of all attackers. However, fog and clouds covered many of the targets of *Luftflotte* 4 (East Prussia) in particular;⁴¹ moreover, the Poles had expected the German move and had dispersed or hidden many of their own aircraft. While the German pilots reported many Polish aircraft destroyed, a large part of those consisted of obsolete or unserviceable machines deliberately left on the runways, and some were

dummies. Attacks on Polish ground installations only gradually made their effects felt, with the result that the Polish air force was not really defeated for a week or so and could continue to fly at least some missions until the very last days of the campaign. By that time, numbers counted. The Luftwaffe initially enjoyed a six-to-one numerical advantage. Since most of its fighter aircraft were clearly superior to the Polish ones, it was able to establish air superiority although not to the extent of avoiding heavy losses. (No fewer than one-third of all the German aircraft engaged were destroyed or damaged.)⁴² Although the campaign moved much faster than had been the case in Spain, good air-to-ground communications had still not been established. Hence, most air attacks on Polish troop concentrations, railway trains, and troop convoys—which, being horse drawn, were not easily distinguished from refugee columns—had to be carried out deep in the rear. This entailed the use of moving bombing lines that staff officers strove to keep up to date, though not always with success.⁴³

The effectiveness of the German air attacks is debatable. At the time, it seemed almost like the apocalypse had come, as testimonies by Polish officers and other survivors prove.⁴⁴ On the other hand, a survey conducted by the Germans themselves after the campaign found the actual damage to be disappointingly slight.⁴⁵ Considering the fact that the Luftwaffe's aircraft were light by later standards and that only a minority of them were dive-bombers capable of any accuracy (the Germans completely lacked high-altitude bombsights), this is not surprising. Some of the damage was purely psychological. (For example, the pilots of Henschel Hs-123 [light ground-attack] aircraft found that they could cause enemy columns to disperse in panic if, by making their airscrews turn at certain speeds, they imitated the sound of machine guns firing.) The final verdict must be that, although material results were often meager, air power caused widespread demoralization and disorganization, including the disruption of the Polish telecommunications

network.⁴⁶ Poland was a flat and largely open country, in many ways ideally suited to attacks from the air. Air power may not have destroyed the Polish forces in toto, but it certainly forced them to disperse. Traffic on the principal roads and railway lines was interrupted, although the Germans, desirous of preserving the bridges for their own use, often employed fragmentation bombs (*Splitterbomben*) in order to maximize the effect against convoys while avoiding damage to the structures themselves.⁴⁷ Supplies and reinforcements were interdicted and failed to arrive. With Luftwaffe interdiction sorties numbering almost 5,000 during the first five days alone, the Poles were soon able to move only by night. In addition, they had to constantly worry about attacks against which they had very little protection.

From the special point of view of maneuver warfare, the original mission given to the Luftwaffe was to prevent the Poles from mounting a counteroffensive against the Suwalki area in East Prussia.⁴⁸ When the counteroffensive failed to materialize, the Luftwaffe focused on securing the flanks of the advancing German armies by attacking the approaches that led to them. In fact, the majority of its missions were devoted to that task.⁴⁹ In this capacity, the Luftwaffe proved its mettle on two occasions in particular. The first was during the battle for the Radom pocket southeast of Warsaw. Here the aircraft of *Luftflotte 4* were able to halt all rail and road traffic, thus preventing the main Polish reserve force (the so-called Prusy Army) from carrying out its planned counterattack at Kielce; later this force, its route across the Vistula blocked, was pounded from the air until 60,000 men laid down their arms.⁵⁰ The second came on the river Bzura, 70 miles west of Warsaw, during the second week of September.⁵¹ The Polish Poznan Army, coming from the north and fighting desperately to avoid encirclement, made use of night marches in order to hide its preparations for a counterattack. Gen Johannes von Blaskowitz's German Eighth Army, making light of its opponent, was taken by surprise and driven back 10 miles over a 30-mile front. The

main German armored forces were far away to the east and separated from the scene by the river Vistula as well as the city of Warsaw itself. Accordingly, it fell to the Luftwaffe to play the decisive role in repulsing the assault. This it did most effectively, flying 1,693 sorties between 11 and 17 September and holding the Poles in check until the German Tenth Army could change front, come to its neighbor's aid, and force the surrender of 170,000 men.⁵² These two occasions turned out to be the first when the Luftwaffe, by striking deep into the rear of an enemy counterattack, was able to protect one of those long, exposed flanks that were the natural result of German-style *operativ* warfare. They were by no means to be the last.

This being a study of maneuver warfare, we need not be concerned here with the extent to which the Germans engaged in strategic air operations. There certainly were attacks on purely civilian targets; however, many of these seem to have been the result of errors in identification or else of individual pilots getting rid of their surplus armament on their way back from missions. Attacks on Warsaw—which the Poles had declared “a fortress”—were initially limited to such targets as radio stations, power plants, and water-pumping stations,⁵³ though the ancillary damage done was certainly considerable. Only toward the end of the campaign did the Germans, having repeatedly failed to induce the Polish government to lay down its arms, deliberately attack civilian targets on a large scale in order to bring about the city's surrender. When the commanding general of the German Eighth Army protested and argued that his artillerymen were prevented from seeing their targets by the smoke of the incendiaries dropped by the Luftwaffe, his arguments were put aside by Hitler himself.

By that time, Polish opposition both in the air and from the ground had diminished to the point where the excruciatingly slow Ju-52 transport aircraft (their maximum speed was around 170 miles per hour) could be used as bombers; this was done simply by having two crewmen

stand at the open doors and shovel out loads of small incendiary bombs. Though many Poles died in the crowded apartment buildings,⁵⁴ the weight of the bombardment—500 tons of high explosives plus 72 tons of incendiaries—was not comparable to subsequent German and Allied use of air power against cities. In the end, the capitulation of Warsaw on 28 September was brought about as much by a lack of supplies as by air power per se, for the city had been completely surrounded for 10 days.

Through all this, the German doctrine was not *blitzkrieg* (“lightning war”)—the term itself had yet to be invented—but the good old *operativ* style of warfare dating back at least to Moltke. It did not envisage pencil-like strokes by independent armored forces deep into the enemy’s country but rather a series of massive moves coming from different directions, encircling the enemy, and ending, so far as possible, in a *Kesselschlacht* that would crush a common enemy between them.⁵⁵ The original German plan for the West, to which Hitler turned his attention within days of bringing the Polish campaign to an end, did not even envisage this. In many ways, it was a singularly unimaginative affair, designed to push forces westward from the border across Belgium and parts of the southern Netherlands in order to reach the North Sea and establish bases for air warfare against Britain. Since no encircling move around Paris was included in the scheme, the description of it as a repetition of the Schlieffen Plan is incorrect. Also, there were exactly opposite reasons for the shortcomings of both plans. In 1914, the German General Staff had displayed excessive boldness in relying on nonexistent technical possibilities. Twenty-five years later, their successors were plagued by a distinct lack of imagination and, above all, a failure even to think about the way in which final victory could be won.

The story of how this plan was abandoned and replaced by what became one of the classic military operations of all time need not be recounted here.⁵⁶ Who first proposed the

plan is immaterial, whether it was Hitler himself, Chief of the Army General Staff Gen Franz Halder, Gen Erich von Manstein (at that time chief of staff to an army group in the West, having been demoted from head of the Operations Department, Army General Staff, Berlin), or Gen Heinz Guderian (serving as an armored corps commander). Suffice it to say that the original plan fell into Allied hands when a German liaison plane force-landed at Mechelen, Belgium, on 10 January 1940. In retrospect, this proved to be a stroke of luck for the Germans, since it forced them to adopt a new plan and thus acquire the tremendous advantage of surprise.

The Allies, led by Gen Maurice Gamelin, the French commander in chief, had originally planned to respond to a prospective German invasion of Belgium by moving their forces northeastward to the river Dyle.⁵⁷ Granted access to the adversary's plans, they not only concluded that their dispositions were correct but decided to move their forces even further north in order to link up with the Dutch at Breda. This maneuver was well suited for dealing with a repetition of the Schlieffen Plan; however, it exposed the Allied rear to a counterstroke delivered by way of the Ardennes, a region which they—and specifically General Gamelin, who in 1937 had made a personal study of the problem—considered as nearly impassable for mechanized forces.⁵⁸ It was defended only by the French Second Army, a weak and demoralized force of reservists largely armed with leftover World War I weapons. Faced with this formation, the Germans went on to apply another fundamental principle of war when they built up a very heavy concentration of forces in the form of Army Group A, including nine out of 10 armored divisions available. Relying on deception, albeit it inadvertent, the Germans were thus able to focus strength against weakness and, a greater feat still, to do so at a decisive point; the small town of Sedan was to prove the key to their entire operation (fig. 2).

In preparing for the campaign, the Luftwaffe divided its forces into two *Luftflotten*. *Luftflotte* 2 under Gen Albert

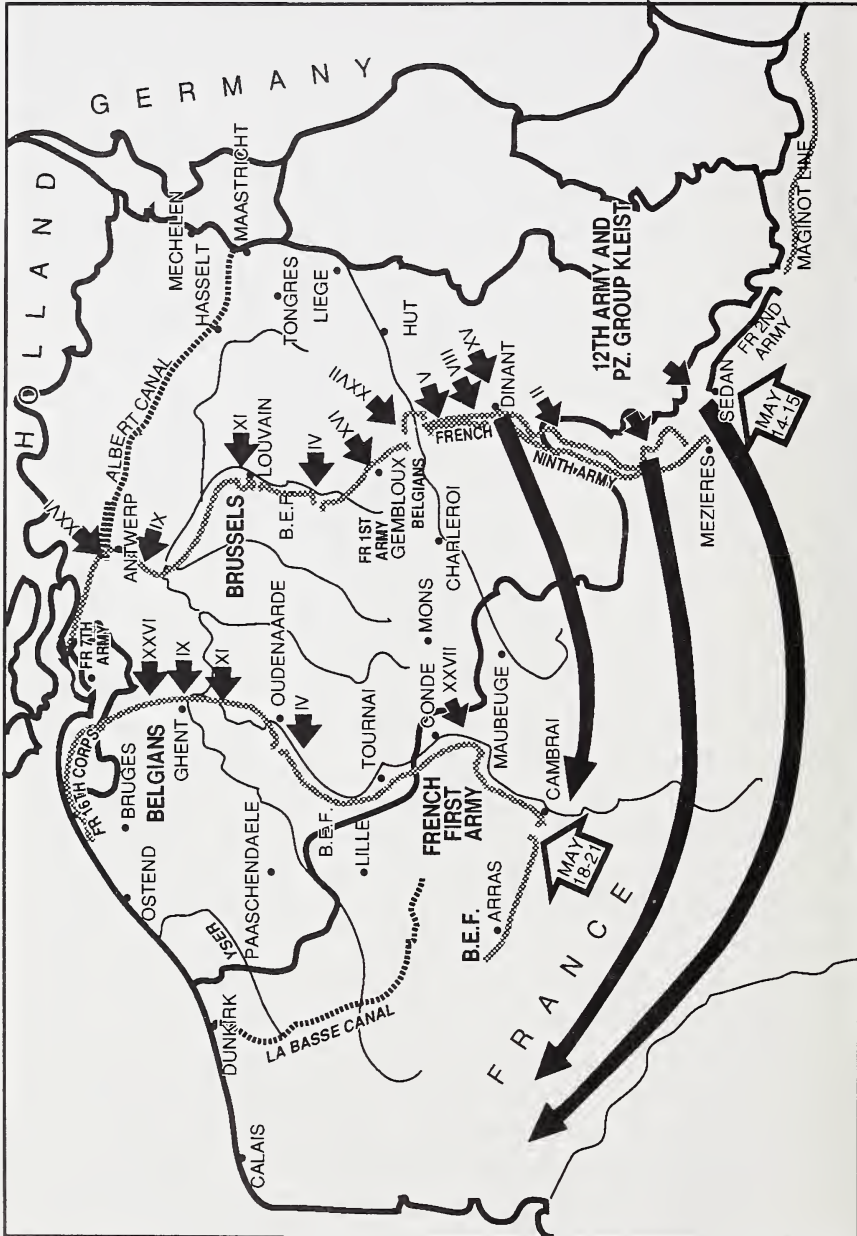


Figure 2. The Campaign in the West

Kesselring was attached to Army Group B, which stood ready to invade Belgium and the Netherlands. *Luftflotte 3* under General Sperrle was detailed to support the critical Army Group A. In numbers of combat aircraft (fighters, bombers, and ground support), the two forces together outnumbered the Allies 2,474 to 2,196 (another 850 first-line combat aircraft, including all of the excellent Spitfire squadrons, were kept back in England).⁵⁹ The quality of the bombers on both sides was roughly equal; however, the German Me-109 fighter enjoyed a clear edge over all but the relatively few French Dewoitine 520s and British Hurricanes that were available. Even at this late date, only 15 percent of the German combat aircraft were specialized for close-support missions.⁶⁰ The rest consisted of single- and twin-engined fighters, as well as comparatively light twin-engined bombers that were unable to carry much more than two tons of ordnance.

Perhaps more important than these qualitative and quantitative advantages, the Germans possessed the initiative and, as it turned out, incomparably superior momentum. In addition, they had a unified command system that enabled them to share information throughout the forces and to shift resources from one point to another as the leadership saw fit. By contrast, the Allies never got their act together, let alone set up a single command organization capable of coordinating all their forces. When the German attack came, the Dutch, isolated in the north, would fight their own war and would be overwhelmed before anybody could come to their aid. The Belgians, who before the war had even refused to allow Allied officers to reconnoiter their prospective positions on the Dyle, would surrender—some would claim prematurely—on 28 May. Even before this took place, Field Marshal John Gort, commanding the British Expeditionary Force, had decided to evacuate the continent and had begun the necessary preparations. When the Belgian surrender became known, he would at once put these plans into effect without waiting to coordinate with

the French or even to inform their high command. Among all the causes of the “strange defeat,” this one should by no means be overlooked.

On 10 May 1940, the Luftwaffe lived up to its aggressive reputation by launching the campaign with a surprise blow at the enemy air forces. At dawn, over 300 Heinkel and Dornier bombers attacked 22 airfields in the Netherlands, Belgium, and northern France. The Dutch had received warning from sources inside the Abwehr, the German military counterintelligence service in Berlin, and at least some of their aircraft had been dispersed.⁶¹ Nevertheless, the damage done in attacks on the airfields as well as in air-to-air combat took its toll. By the evening of the first day, three quarters of the *Koninklijke Luchtmacht* (Royal Netherlands Air Force) had either been destroyed or rendered hors de combat. Attacks on the Belgian and French air forces were also quite successful; the British alone escaped serious damage. The daily reports of the German Armed Forces High Command tell the story in numerical terms. They claimed 300–400 Allied aircraft destroyed on 10 May, 300 on the 11th, 320 on the 12th, 150 on the 13th, 200 on the 14th, 98 on the 15th, 59 on the 16th (clearly, the opposition was diminishing), 108 on the 17th, 147 on the 18th, 143 on the 19th, 47 on the 20th, and 120 on the 21st—a total of over 2,000 aircraft. These figures were almost certainly exaggerated; still, the fact remains that by the end of no more than one week, the Dutch, Belgian, and French air forces had been eliminated as fighting organizations. Even the British, who were least affected, lost one-half of all the frontline aircraft they had possessed both in the United Kingdom and on the continent at the start of the campaign. In comparison, the Luftwaffe lost some 1,130 aircraft of all types, comprising approximately one-quarter of its strength. Out of these, 539 were lost during the first six days of operations.

Exploiting their command of the air, the Germans next made innovative use of air power in support of their *operativ*

ground offensive. The possibilities of airborne warfare had been much discussed during the interwar period and experiments had been conducted by the Soviet, Italian, and German air forces among others. However, when hostilities broke out, it was only the Germans who had the necessary troops and equipment in place and who had worked out the appropriate organization. To them, airborne warfare was a question of neither simple descents into the enemy's rear nor "vertical envelopment"; rather, in conformity to their *operativ* doctrine, airborne forces were seen as can openers. Though explicit evidence is lacking, the Germans seem to have understood that airborne forces, lacking artillery and other heavy weapons as well as mechanized transport, would not be able to resist a determined counterattack for very long. Hence it was a question of seizing key objectives that were not too far ahead of the front as to be totally out of reach. Once they had been seized, the objectives would have to be held until the ground forces, engaging in a rapid war of maneuver, could reach them.⁶²

The most important objectives consisted of the bridges crossing the great Dutch rivers at Rotterdam, Dordrecht, and Moerdijk and those over the Belgian Albert Canal, protected by the fortress at Eben Emael. The first group of bridges represented the key to Fortress Holland because the bridges in the northwestern region of the Netherlands were in an area which, being low lying and capable of being flooded, had protected Amsterdam against invasion ever since the War of Liberation in the sixteenth century. The bridges over the Albert Canal, which constituted a formidable antitank ditch with vertical concrete walls along much of its length, had to be crossed if Belgium was to be invaded. As in all maneuver warfare, it was a question of somehow finding a soft spot in a vital objective and using surprise to capture it. The Germans brilliantly succeeded in doing both.

On the morning of 10 May, the Dutch bridges were seized by three battalions of paratroopers. Four hundred airborne troops captured two out of the three bridges over the Albert

Canal; meanwhile, Eben Emael, which bristled with artillery and had the reputation of being the strongest fortress in Europe, was assaulted by a small detachment of gliderborne troops under the command of a lieutenant who landed on its unprotected roof.⁶³

The Germans also attempted to repeat their Norwegian feat of April 1940. On that occasion, they had landed an airborne battalion on an airfield near Oslo and, accompanied by a military band, marched into that city and occupied government buildings. The Dutch, however, proved to be made of sterner stuff. When the gliders landed and disembarked troops on three airfields near The Hague, the Dutch army, though taken by surprise, refused to panic and brought up artillery and counterattacked. For four days, it was all the Luftwaffe could do to keep the Dutch from annihilating the German infantry on the ground by bombing and strafing the forces that surrounded the airfields. These Dutch forces were still successfully holding off the invaders when their country surrendered five days later.

Although Rotterdam had been cut in half by the Germans holding the Maas River bridges, Dutch forces in the city were still holding out three days after the beginning of the war. This prevented the Germans from completing their victory. And, more important, it caused them to worry lest the British try to land forces in their rear and delay the advance of Army Group B, just as a similar British force in Antwerp had delayed those of Schlieffen's First Army in World War I. To prevent this, Gen Georg von Kuechler, the commander of the German Eighteenth Army, received orders on the evening of 13 May to attack on the morrow and break the city's resistance. Just as in the case of Warsaw seven months previously, the offensive was to be opened by an air strike against the Dutch forces that clung to the northern end of the bridges. Also, as in the case of Warsaw, the Germans wanted to see if they could not induce the commander in the city to surrender first. The talks on the morning of the 14th led nowhere. Only during the

afternoon did the responsible Dutch commander begin to appear as if he might give in, but by then it was too late. The hundred or so He-111 bombers forming part of *Luftflotte* 2 and destined to carry out the attack had already taken off from their airfields in western Germany. Lacking direct radio contact with them, the German commanders on the spot tried to warn the pilots of these aircraft away by firing red Very signals, but only about half received the message and understood it. But the pilots of 57 of the aircraft flew in at 2,000 feet and dropped 97 tons of high explosives. By later standards it was a mere pinprick. However, a margarine factory was accidentally hit and the resulting conflagration was enough to set the old, wooden city on fire and destroy its entire western part.

The tragic consequences that grew out of the German failure to contact their own forces at Rotterdam highlighted a larger problem—the absence of a proper mechanism by which their air and ground forces could be coordinated with each other. The difficulty of doing this had already marked Richthofen's operations in Spain, whereas the German troops during the Polish campaign had received occasional doses of their own medicine either by being subjected to Luftwaffe attacks or by having to watch bridges that they themselves had planned to use being blown to pieces in front of their noses.⁶⁴ Air force and army units had agreed on various signals and recognition devices whereby the latter could warn the former of their presence. However, these signals were often either neglected by the troops or misunderstood by the pilots. The problem was serious because operations in Western Europe were to become much more rapid and fluid than the Germans themselves had ever expected.

In the spring of 1940, following their experiences in Poland, the Germans had two ways in which their air and ground field units could cooperate with each other.⁶⁵ The first was by way of the *Kommandeure der Luftwaffe*, or *Kolufts*. These officers were subordinate to the Luftwaffe

representative at the General Staff, Ground Army, and attached to ground headquarters at corps and army level. The *Kolufsts* were in charge of the airborne reconnaissance units assigned to the army. To permit close cooperation, direct radio links—at first Morse Code, later voice—were set up between those units and the artillery batteries. The *Kolufsts*, however, had neither authority over nor even direct communications with the Luftwaffe's combat units, including its close-support forces. To maintain contact with them, a second channel of communication was set up in the form of the *Fliegersoffizieren*, or *Flivos*, who were attached to corps and army headquarters. Accompanied by a few assistants, the *Flivos* traveled in armored vehicles. They were thus in a good position to observe hostilities on the ground and to report the army's wishes to the *Nahkampffuehrer* (close-combat commanding officer) at air force headquarters. However, neither they nor the army commanders had the authority to order air support. According to Richthofen, the Luftwaffe was neither a whore to follow where the army led nor a fire brigade on call to put out even the smallest conflagrations.⁶⁶ Reichsmarschall Hermann Goering was very jealous of his power and insisted that whatever could fly belonged to him. Throughout the war, he consistently refused to let the army (or the navy) exercise command over aircraft beyond those assigned to it for purposes of reconnaissance, liaison, and artillery observation. Perhaps as a result, the *Flivos* were not even given radio equipment to talk to the aircraft overhead.

Given these limitations, it is not surprising that the Luftwaffe during the French campaign continued to show a strong preference for those kinds of operations that did not require direct cooperation with the ground forces. As we saw, this *modus operandi* proved sufficient in the battle for air superiority, and it also proved successful when the problem was to occupy key objectives far behind the front. The Luftwaffe's strikes into the deep rear, which began on 10 May and increased thereafter, required an understanding

by air commanders of the situation on the ground but not close cooperation. Even before the army's crossing of the Meuse, the Luftwaffe fighter units had protected the German advance from Allied air attack, though not to the extent of preventing a few casualties from being inflicted on Guderian's XIX Panzer Corps.⁶⁷ At the same time, the Luftwaffe attacked communications leading into the rear of the French Second Army, thereby isolating the battlefield and preventing reinforcements from being brought up.⁶⁸ Later, during the drive from the Meuse to the sea, its aircraft could be found waging *operativ* warfare by striking at troop concentrations, marching columns, railways, and roads throughout the theater of operations.

While the available data do not permit the impact on French logistics to be quantified, there were two occasions when intervention from the air proved particularly significant. The first came on 19 May, when a French armored division commanded by then-Col Charles de Gaulle attempted to advance from the north but was halted before it could seriously disrupt the Germans' westward advance.⁶⁹ The second came on the 22d when the French 4th Armored Division attacked from the south near Arras. The important point is that on both of these occasions, success was made possible by the fact that close cooperation between ground and air was not required. As was usually the case, the Luftwaffe directed its main effort against the enemy's operational reserves rather than its front. Hence, all its commanders needed was to be familiar with the general situation. They acquired this familiarity from reconnaissance by their own rear headquarters rather than by direct communication with the army's advancing spearheads.

The available records show that there was only one important occasion throughout the Western campaign when the Luftwaffe, disregarding its own official doctrine, focused mainly on the close-support role. This took place on 13 May when the river Meuse, reached by the German spearheads and about to be crossed by them, formed a clear dividing line

between the two sides. The details had been arranged in advance by means of direct, face-to-face contacts between the local ground and air commanders, specifically Guderian and Gen Bruno Loerzer, the commander of *Fliegerkorps II* (Second Air Corps). The front along the river was divided into numbered sectors, a further distinction being drawn between targets immediately on the banks and those located further in the rear. The commanding general of Panzer Group Kleist, Ewald von Kleist, wanted a single mighty blow, but his wishes were disregarded.⁷⁰ Instead, it was decided that the Luftwaffe would launch continuous “rolling” attacks (clearly modeled upon an artillery barrage) in order to paralyze the defenders, disrupt their communications, and force them to keep their heads down.⁷¹

Beginning on the morning of 13 May, waves of Stukas and other bombers were sent in until much of *Luftflotte 3* was drawn into the effort. Hundreds of sorties were flown against the unfortunate French troops. Although not many of these troops were killed—even the Stukas, for all their vaunted ability to dive bomb, proved surprisingly inaccurate—they were nevertheless deafened by the noise, blinded by the smoke, rendered unable to get in touch with each other, and forced to remain inactive even as German assault parties crossed the river in rubber boats.⁷² To repeat, all this was made possible mainly by the fact that operations on the far side of the Meuse were conducted against stationary objectives and did *not* have to be closely coordinated with the army. Once the river had been crossed, the Luftwaffe reverted to form. A moving security zone was established ahead of the advancing panzers, and attacks were mounted mainly against targets in the Allied rear.

During all this, the Luftwaffe’s other great contribution was to protect the bridgeheads against Allied air attack. The British and the French had largely ignored the Ardennes in their prewar planning. However, once the German spearheads started pointing toward the river Meuse, one attempt after another was made to halt the panzers by bombing

them from the air.⁷³ On 14 May, the Royal Air Force (RAF) in particular launched a determined attack against the bridges. Opposed by the Luftwaffe both from the ground (under the German system of organization, anti-aircraft artillery formed part of the air force) and in the air, the RAF took so many losses that its bomber arm on the continent almost ceased to exist. By the evening, the smoking remains of 89 Allied aircraft dotted the countryside around Sedan alone.⁷⁴ It was perhaps the decisive moment of the entire campaign.

Thus, assisted from above, the panzers gained operational freedom on 15 May. It was largely thanks to the Luftwaffe that the army which the French had improvised to seal the breach (the Sixth Army) never had time to gather its wits, let alone its forces; indeed, its commander, Gen Robert Touchon, had himself been one of the principal opponents of an independent French armored force.⁷⁵ The most important obstacle facing the German armored spearheads in Flanders was not so much the French, who were mostly retreating in disorder, as it was their own inability to enforce strict traffic control. The few roads leading through the Ardennes became congested. Supplies, particularly fuel, failed to reach the forward units; on 14–16 May, the Luftwaffe had to make air drops to provide them with ammunition and petroleum, oil, and lubricants (POL).⁷⁶ Once supplied, they were able to drive forward almost unopposed, pushing a narrow, deep wedge far into their opponent's rear.

As they approached the coast at Abbeville on 20 May, the Germans hesitated. Success had been so great and so unexpected that they were suspicious that a trap had been set; Hitler, Gen Gerd von Rundstedt of Army Group A, Gen Ernst Busch of Sixteenth Army, and even General von Kleist of Panzer Group Kleist all at one time or another wanted to rein in their forces' advance and, on at least three occasions (14, 17, and 22 May), succeeded in doing so.⁷⁷ Just how the order that finally brought the tanks to a halt in front of Dunkirk came to be issued remains unclear. As best

the postwar witnesses could recall, it was Goering who, as early as 23 May, suggested to Hitler that the job of finishing off the enemy inside the cauldron be left to "his" air force alone.⁷⁸ We do not know the reason for the decision. It may have been motivated by a mistaken belief that the terrain was unsuitable for armor, or else by the desire to save it for the second phase of the campaign.

The Luftwaffe was able to start flying in fuel, ammunition, and technicians from Charleville within 24 hours of its evacuation by the French. Its virtuosity in rapidly shifting its ground organization according to changing operational requirements was thus demonstrated once again. Nevertheless, even after three weeks of campaigning, the bulk of its forces still continued to operate from airfields in western Germany.⁷⁹ As a result, the German Me-109 fighters—whose outstanding defect was their short range—were at a disadvantage compared to the British Hurricanes and Spitfires that took off to confront them from secure airfields just beyond the English Channel. For the first time since the early days of the Spanish Civil War, the Luftwaffe at Dunkirk was unable to establish clear air superiority over a selected theater of operations. There developed a series of air-to-air battles in which both sides lost heavily. The German bombers were prevented from concentrating on the ongoing evacuation, especially since they had to be diverted time after time in order to help stop violent Allied counterattacks.

By 27 May, a mere two days after the order to halt had been issued, it had become clear that a major evacuation effort was under way and that the Luftwaffe on its own was powerless to stop it. Hitler thereupon ordered his tanks to resume their advance, but by then it was already too late since the time wasted had been used by the Allies to prepare their defenses. Next, bad weather intervened; it was not until 1 June that the clouds cleared and the Luftwaffe, flying again, was able to sink 14 ships. After this, the British, harassed by the Luftwaffe but not to the point

where operations had to be suspended or even seriously interrupted, limited the evacuation to nighttime. By 4 June, German forces were in control of the entire Channel coast. It was as great a triumph as any they were to enjoy for the rest of the war.

Since the 1940 German campaign is one of the most heavily studied of all time, the effort to understand the role played by the Luftwaffe in it brings few surprises. Perhaps the most fundamental point to emerge is the unique nature of German air doctrine as it then stood. Cutting across our present distinctions between the strategic and the tactical, it sought to bring about the enemy's destruction by *operativ* warfare in conjunction with, but not in subordination to, the ground forces. The first and most vital stage in its implementation was the achievement of air superiority through combining air-to-air combat with attacks on airfields and rear installations. Next came the use of airborne forces as can openers at selected points, a technique which at that time was completely new and which the Allies did not employ for the first time until three years later in Sicily. The bulk of the Luftwaffe's effort was devoted to what we today would call behind-the-front interdiction but which, under their terminology, included considerably more than merely attacks on lines of communications.⁸⁰ The great advantage of such operations was precisely that they did not require close cooperation with the ground forces—something for which, as we saw, the Germans were neither organized nor equipped.

As if to confirm that this was indeed their line of thought, in 1940 the Germans assigned their acknowledged close-support experts—Richthofen's *Fliegerkorps* VIII (Eighth Air Corps)—to *Luftflotte* 2, where they would have to work in conjunction with the largely unmotorized Army Group B. Only when the spearheads of Panzer Group Kleist reached the Meuse did the Luftwaffe high command exercise its prerogatives by switching this force to assist in the bombardment that covered the crossing, a bombardment

itself made possible by the fact that the forces on both sides, as in World War I, were separated by a clear geographical line. Once this phase was over, the Luftwaffe reverted to form. As had already been the case in Poland, it did not try to coordinate its missions with the racing armor but flew the great majority against targets well behind the front. In this way, the problem of distinguishing friend from foe and securing good air-to-ground cooperation was not so much solved as evaded.

On the plus side, several strong points of the Luftwaffe played an important role in the campaign and are worth spelling out. In spite of organizational and technical problems, understanding between air and ground officers at the headquarters level was generally very good due to the fact that all the senior Luftwaffe commanders were ex-army personnel. Since the majority of aircraft (Stukas in particular) were simple and easy to maintain, they often could fly an astonishing number of missions per day (as many as eight); and because this was a brief campaign conducted under favorable climatic conditions and in a theater of war where communications were generally excellent, high levels of operational serviceability could be achieved and maintained. The German air force's ability to rapidly redeploy its forces, all the more important in view of the short range possessed by its principal fighter aircraft, has already been mentioned. It was largely due to the excellent airfield-construction companies that followed in the wake of the armored spearheads and, using every means available, were capable of making a field serviceable within a matter of hours.

A final verdict on German maneuver warfare at this time must mention a paradox. In May 1940, despite many lessons learned in Poland, blitzkrieg as a doctrine was only just being born and had not yet been christened. The campaign therefore developed as a mixture of the old *operativ* doctrine and the new system of independent, deep-striking operations by mechanized forces, a fact that explains the

peculiar nervousness displayed by many echelons in the German command at various points in the war. Only *after* hostilities were over did the Germans fully understand the extent of the revolution that they had wrought in warfare, and only then did blitzkrieg receive its name. Meanwhile, the campaign had displayed many of the principles of war in action. The Germans had managed to preserve operational—though not strategic—secrecy. Secrecy, in turn, helped them deceive the enemy as to the location of the main attack and achieve surprise.

While a frontal advance, assisted by spectacular airborne operations, was launched into the Netherlands and Belgium and held the enemy's attention, Army Group A built up a heavy concentration of forces prepared to strike into the Allied center of gravity, which was also a vulnerable spot. Once that spot had been taken and left behind, the Germans continued forward, bypassing and encircling the bulk of the enemy forces while relying on sheer speed for protection. The enemy was overwhelmed not so much by firepower, although that played a role, as by rapid movements that carved up the theater and left him unable to react until it was too late. The Luftwaffe, in spite of many weaknesses, not only managed to gain control of the air—an indispensable prerequisite—but played an active role in each one of these stages. In such a way did it make its contribution to maneuver warfare.

Notes

1. See Carl von Clausewitz, *On War*, ed. and trans. Michael Howard and Peter Paret (Princeton, N.J.: Princeton University Press, 1976), 595ff.
2. See Eberhard Kessel, *Moltke* (Stuttgart: Koehler, 1957), 507–9.
3. Quoted in Wolfgang Foerster, ed., *Friedrich Karl von Preussen: Denkwuerdigkeiten aus seinen Leben*, vol. 2 (Stuttgart: Deutsche Verlag, 1910), 67.
4. On Schlieffen's theories of war, see Gerhard Ritter, *The Schlieffen Plan: Critique of a Myth* (New York: Praeger, 1958), 3–10. On the doctrine of *Kesselschlacht* as a whole, see Matthew Cooper, *The German Army* (New York: Stein and Day, 1978), 130ff.
5. See especially Martin van Creveld, *Supplying War: Logistics from Wallenstein to Patton* (London: Cambridge University Press, 1978), chap. 4; also idem, *Command in War* (Cambridge, Mass.: Harvard University Press, 1985), 148ff.
6. See Robert B. Asprey, *The First Battle of the Marne* (Philadelphia: Lippincott, 1962).
7. See Martin van Creveld, *Technology and War* (New York: Free Press, 1989), 184ff.
8. See Brereton Greenhous, "Evolution of the Close Combat Support Role for Aircraft in World War I," *Military Affairs* 21, no. 1 (February 1975): 22–27.
9. See Army War College, "The Infantry Airplane and the Infantry Balloon," English translation of a captured German document dated 1 September 1917, copy in National Air and Space Museum Library, Washington, D.C.
10. See Ernst Wilhelm von Hoepfner, *Deutschlands Krieg in der Luft: Ein Rückblick auf die Entwirklung und die Leistungen unserer Heeres Luftstrit Kräfte im Weltkrieg* (Leipzig: Koehler und Umeland, 1921), 149. The author, a general of cavalry, commanded the German air force during the last stages of World War I.
11. See van Creveld, *Command in War*, 168ff.
12. See Hans von Seeckt, *Thoughts of a Soldier* (London: E. Benn, Ltd., 1930), 63–64. There is a good chapter on Seeckt in Jehuda Wallach, *Kriegstheorien* (Frankfurt am Main: Bernhard und Graefe, 1971).
13. For the creation of the German armored forces, see Heinz Guderian, *Panzer Leader* (London: Joseph, 1953), 30–63.
14. See Erich von Ludendorff, *The Nation at War* (London: Hutchinson, and Co., Ltd., n.d.), particularly chap. 1.
15. See, for example, Oberbefehlshaber der Luftwaffe, "Wehrmachtmanoever (Luftwaffe) 1937," German military records (hereinafter cited as GMR), in the Collection of Seized Enemy Records, 1941–, Record Group 242, National Archives, Washington, D.C. (microfilm), Microfilm Publication T-321, roll 10, frames 4749773ff. (T-321/10/4749773ff.); also

Ruewehr, "Der Luftkrieg ueber Mittel- und Westeuropa, 1939-41," GMR, T-971/18/000221/6.

16. See, for example, "Gedanken zur Operativen Luftkrieg," GMR, T-321/10/474790ff.

17. See Klaus A. Maier et al., *Germany and the Second World War*, vol. 2, *Germany's Initial Conquests in Europe* (Oxford: Clarendon Press, 1991), 34ff.

18. *Ibid.*, 36.

19. For the history of the manual, see Paul Deichmann, *Der Chef in Hintergrund: ein Leben als Soldaten von der preussischen Armee bis zur Bundeswehr* (Oldenburg: Stalling Verlag, 1979), 58-63; for an analysis, see Williamson Murray, "A Tale of Two Doctrines: The Luftwaffe's 'Conduct of the Air War' and the USAF's Manual 1-1," *Journal of Strategic Studies* 6 (December 1983): 84-93.

20. Generalstab der Luftwaffe, *Die Luftkriegsfuehrung* (Berlin, 1935), par. 2. To emphasize the point, the *Luftwaffeakademie* also brought out a new edition of Clausewitz.

21. *Ibid.*, par. 9.

22. *Ibid.*, par. 31.

23. On these aspects of German prewar air doctrine, see Herhudt von Rohden, *Vom Luftkriegsfuehrung: Gedanken ueber Fuehrung und Einsatz Moderner Luftwaffen* (Berlin: Mittler, 1938); Horst Boog, *Die deutsche Luftwaffe, 1935-1943: Fuehrungsprobleme - Spitzengliederung - Generalstabsausbildung* (Stuttgart: Deutsche Verlags-Anstalt, 1982), 151-64; and Oberbefehlshaber der Luftwaffe, "Richtlinien fuer den Einsaetze der Fliegertruppe zur unmittelbaren Unterstuetzung des Heeres," 1 August 1939, GMR, T-324/76/(unframed).

24. See Hans von Seeckt, *Gedanken eines Soldaten* (Berlin: Verlag fuer Kulturpolitik, 1929), 91-95.

25. See OKL, Generalstab, 8. Abteilung, "The Douhet Theory and Its Application to the Present War," Air Historical Branch translation no. VII/11, USAF Historical Research Agency (USAFHRA), 512.621, VII/11. This study was originally written in November 1944.

26. On all this, see Raymond L. Proctor, *Hitler's Luftwaffe in the Spanish Civil War* (Westport, Conn.: Greenwood Press, 1983), *passim*.

27. Quoted in Klaus A. Maier, *Guernica, 26.4.1937: die Deutsche Intervention in Spanien und der "Fall Guernica"* (Freiburg: Rombach Verlag, 1975), appendix 1, constituting Richthofen's diary entry for 2 April 1937.

28. Proctor, 122, 253.

29. *Ibid.*, 104-14.

30. *Ibid.*, 229.

31. *Ibid.*; see also Williamson Murray, *Strategy for Defeat: The Luftwaffe, 1933-1945* (Maxwell AFB, Ala.: Air University Press, 1983), 16.

32. See Proctor, *passim*.
33. *Ibid.*, 256.
34. Specifically on this point, see von Rohden, *Vom Luftkriegsfuehrung*, 10; also Oberbefehlshaber der Luftwaffe, "Richtlinien fuer den Einsatz der Fliegertruppe," 6. Here it is explicitly stated that "only in exceptional cases is the employment against the enemy [FEBA] effective."
35. Herhudt von Rohden, "Luftwaffe and Gesamtkriegsfuehrung," in E. Eichelbaum, ed., *Das Buch von der Luftwaffe* (Berlin: Bong, 1938), 20.
36. For a list of the various types, see Matthew Cooper, *The German Air Force, 1933-1945: An Anatomy of Failure* (London: Jane's, 1981), 93. The total number of first-line combat aircraft was around 2,355. Of those, 1,176 were bombers, 1,079 single- and twin-engined fighters, and only 406 ground attack aircraft—including 40 Hs-123s that were hopelessly out of date.
37. Williamson Murray, "The Luftwaffe and Close Air Support, 1939-1941" (Unpublished paper, 1984), 106-7.
38. Generalkommando III. A. K., Abt. Ia op., nr. 1633/36 g., "Zusammenarbeit mit der Luftwaffe," 15 December 1936, GMR, T-405/6/4834188ff., reporting on the autumn 1936 maneuvers.
39. For a detailed order of battle presentation, see Generalstab der Luftwaffe, Wehrwissenschaftliche Abteilung, "Der Einsatz der Operativen Luftwaffe gegen Polen," *ibid.*, T-971/19/000877ff./25-9.
40. Richard Suchenwirth, *The Development of the German Air Force, 1918-1939*, USAF Historical Study no. 160 (Maxwell AFB, Ala.: USAF Historical Division, Air University, 1968), 140; Herhudt von Rohden, "Die Planung und Vorbereitung des Luftkriegs gegen Polen 1939," *Luftkrieg*, no. 5, appendix 6, 1946.
41. *Ibid.*, 49.
42. See Georg W. Feuchter, *Geschichte der Luftkrieg* (Frankfurt am Main: Athenaeum, 1954), 112-13.
43. See R. R. Muller, "The German Air Force and the Campaign against the Soviet Union, 1941-1945" (PhD diss., Ohio State University, 1990), 83, for the details.
44. Paul Deichmann, *German Air Operations in Support of the Army*, USAF Historical Study no. 163 (Maxwell AFB, Ala.: USAF Historical Division, Air University, 1962), 105.
45. "Erfahrungsbericht der Luftflotte 1 ueber den polnischen Feldzug," quoted in Murray, "Luftwaffe and Close Air Support," 20-21; Generalstab der Luftwaffe, 8. (Kriegswissenschaftliche) Abteilung, "Vortrag ueber der Luftkrieg in Polen 1939: 23 July 1944," GMR, T-971/18/00264/21.
46. "Der Einsatz der Operativen Luftwaffe gegen Polen," *ibid.*, T-971/19/75.
47. *Ibid.*, 76.

48. *Ibid.*, 30.

49. See Field Marshal Hermann Goering's order, 9 February 1939, in *ibid.*, 74.

50. Maier, *Germany and the Second World War*, vol. 2, 113.

51. See *ibid.*, 114; also R. Elbe, *Die Schlacht an der Bzura in September 1939 aus deutschen und polnischen Sicht* (Freiburg im Breisgau: Rombach, 1975).

52. "Vortrag ueber der Luftkrieg in Polen," GMR, T-971/18/000257-63/14-20.

53. "Der Einsatz der Operativen Luftwaffe gegen Polen," 89. See also Goering order, 16 September 1939, where the list of targets is given as "supply installations (gas, water, and electrical works), casernes, depots (food, ammunition), the citadel, the war-ministry, major communication centers and known artillery positions," GMR, T-971/50/000621-2.

54. Details in "Vortrag ueber der Luftkrieg in Polen," GMR, T-971/18/000260/17.

55. See Matthew Cooper, *The German Army* (New York: Stein and Day, 1978), 174-75, for an analysis. The fact that this was still *operativ* warfare rather than blitzkrieg led to some tension among the senior German commanders, since the exponents of armor argued that more could have been done if only they had been given a free rein. See B. H. Liddell Hart, *History of the Second World War* (New York: Putnam, 1971), 29-30.

56. The most thorough study remains Hans A. Jacobsen, *Fall Gelb: Der Kampf um den deutschen Operationsplan zur Westoffensive 1940* (Wiesbaden: Steiner, 1957), 32ff.; see also Klaus A. Maier, *The Initial German Conquests*, 238ff., for an up-to-date discussion.

57. See Alistair Horne, *To Lose a Battle: France 1940* (London: Macmillan, 1969), 116ff., on the development of the Allied plans.

58. Michael Garder, *La Guerre Secrete des Services speciaux francaises, 1939-1945* (Paris: Plon, 1967), 178-79; and A. Dorgeles, *La Drôle de Guerre* (Paris: Michel, 1971), 123. For German and French views concerning the trafficability of the Ardennes and the time it would take the panzers to reach the Meuse, see also Robert A. Doughty, *The Breaking Point: Sedan and the Fall of France, 1940* (New York: Archon Books, 1990), 77-79.

59. Cooper, *The German Air Force*, 112. Other sources give different figures.

60. See British Air Ministry, *The Rise and Fall of the German Air Force, 1933-1945* (London: H. M. Stationary Office, 1948), 66.

61. Passing an airfield near Rotterdam on the evening of 9 May 1940, the author's grandfather, Louis Wyler, noted that the airfield had been evacuated.

62. An excellent overview of German doctrine in this respect is David Thomas, "The Importance of Commando Operations in Modern Warfare, 1939–1942," *Journal of Contemporary History* 18 (October 1983): 689–711.

63. See GMR, T-314/478/001188-1195, as well as T-315/1010/000436ff., for the official German reports on these operations; for a secondary account, see Walther Melzer, *Albert Kanal und Eben Emael* (Heidelberg: Vowinckel, 1957).

64. See, for example, the after-action reports of the 10th Armored Division, 3 October 1939, GMR, T-314/614/00632ff. On 2 September 1939 Goering had to issue an order to his pilots warning them against attack on friendly tanks. Also see T-971/50/000578-9.

65. For details, see R. R. Muller, "The German Air Force and the Campaign against the Soviet Union, 1941–1945" (PhD diss., Ohio State University, 1990), 46ff.

66. Von Rohden, "Die Deutsche Luftwaffe im Kriege gegen Russland," GMR, T-971/26/000241.

67. Doughty, 267–68.

68. For example, on 12 May two French convoys coming from the south were shot up. See Florian K. Rothbrust, *Guderian's XIXth Panzer Corps and the Battle of France* (New York: Praeger, 1990), 68.

69. Horne, 428.

70. On this strange episode, see Doughty, 132ff.

71. See Murray, *Strategy for Defeat*, 37; and Muller, 49–50, for the details.

72. For a graphic description of the bombardment, see Horne, 189.

73. See Lionel F. Ellis, *The War in France and Flanders, 1939–1940* (London: H.M. Stationary Office, 1953), 54.

74. See Cooper, *The German Air Force*, 113.

75. Doughty, 295ff.

76. Rothbrust, 86–88.

77. For the story of these hesitations, see above all Cooper, *The German Army*, 202ff.

78. See Walter Warlimont, *Inside Hitler's Headquarters, 1939–1945* (London: Weidenfeldt and Nicolson, 1962), 71; also see Maier, *Germany and the Second World War*, vol. 2, 291ff.

79. For example, Kampfgeschwader "Hindenburg" was only moved to bases in France after the fall of Dunkirk; even so, supplies were so short that it was only partly operational. See Spohr, "Kriegschronik des Kampfgeschwaders 'Hindenburg' von Beginn des Polen-Feldzug bis zur Aufloesung des Geschwaders," GMR, T-971/50/000962ff./21.

80. See Chef/Generalstab der 8. (Kriegswissenschaftliche) Abteilung, "Vorstudien zum Luftkrieg," 15 December 1944, *ibid.*, T-971/36/000926ff.

Chapter 3

Maneuver Warfare in Action

The German 1941 Campaign in Russia

This chapter opens with a brief discussion of the development of the German plans for invading Russia as well as the strategic problems involved. Next, it analyzes the role assigned to the Luftwaffe in these plans. It then describes the participation of the Luftwaffe in the campaign by focusing first on the left (northern) wing of the German advance, then on the right (southern) wing, and finally on the center, where the decisive attack against Moscow took place.

The starting point for the campaign was Hitler's long-standing intention to invade and conquer the Soviet Union, the origins of which were not rooted solely in military or political strategy but rather in his national socialist *weltanschauung*, or "world view."¹ Hitler had always been clear in his own mind that one day he would carry out the operation; the question, as far as he was concerned, was not if but when, under what circumstances, and how. The early campaigns for the establishment of German hegemony in Europe, particularly the victory over France, had proceeded much more rapidly and decisively than the Germans themselves had anticipated.² A month had not yet passed since the surrender of France, when Hitler's thoughts returned to the ideologically inspired "master plan" outlined in *Mein Kampf* and his so-called secret book of 1928. German self-confidence was at its peak, even to the point of contemplating the possibility of attacking the Soviet Union that very autumn.³

The role of the Russian campaign in Hitler's politico-military strategy, as well as the way in which it interacted with his conduct of the war as a whole, need not concern us here.⁴ Suffice it to say that as early as the first week of August 1940, preliminary plans for a military campaign

were being drawn up independently from each other at the Armed Forces High Command (*Oberkommando der Wehrmacht*—OKW) and the Ground Army High Command (*Oberkommando des Heeres*—OKH). After some hesitation, both plans concluded that the center of gravity ought to be on the northern side of the Pripet Marshes, which bisected the front. Other than that, they differed widely. The officer responsible at OKW was a Lt Col Bernard von Lossberg. He saw the campaign's objective as seizure of Leningrad—considered the capital of Bolshevism—in the north and Ukrainian economic resources, including wheat, oil and steel, in the south. By contrast, the OKH planner, Gen Erich von Marcks, put greater emphasis on a direct advance by the shortest route to Moscow. This was because Marcks and his immediate superiors considered the city vital both as the center of the Soviet state and as the one objective that the Red Army would not be able to give up and so could be destroyed in front of it.⁵

During the autumn of 1940, the two approaches were worked out in some detail. On 5 December Hitler met with the heads of OKH—Field Marshal Walther von Brauchitsch, army commander in chief, and Gen Franz Halder, chief of staff. Having listened to their presentations, he next saw the deputy head of OKW, Gen Alfred Jodl, who throughout the war acted as his principal adviser on strategy. Directive No. 21, *Operation Barbarossa*, constituting the fundamental campaign plan and embodying the conflicting views of these organizations, was issued 18 December 1940.⁶ The directive conformed to OKH's wishes insofar as it placed the strongest German forces, in the form of Army Group Center, north of the marshes on the direct "historical" route to Moscow. On the other hand, the views of OKW were accepted in that there was no provision for proceeding all the way to that city. Instead, the directive indicated that once the forces had reached as far as Smolensk (on the far side of the Dnieper and approximately two-thirds of the way to Moscow), Hitler reserved for himself the right to turn them north and south

in order to assist in the capture of Leningrad and the Ukraine, respectively.

The plan divided the 144 German divisions earmarked for the operation—117 if the 16 held in reserve and the 11 employed in Finland are excluded—into three army groups. From left to right, these were Army Group North (Field Marshal Wilhelm von Leeb) with 26 divisions, including three armored and three motorized; Army Group Center (Field Marshal Fedor von Bock) with 50 divisions, including nine armored and six motorized; and Army Group South (Field Marshal Gerd von Rundstedt) with 41 divisions, including five armored and three motorized. Starting from East Prussia, Army Group North was to cut off the Soviet forces in the Baltic countries, advance to Leningrad, and provide protection to the left flank of Army Group Center—three objectives that proved incompatible to some extent. Army Group Center was to attack on a 300-mile front, sending out two prongs north and south of Bialystok. The northern prong was to proceed from Suwalki to Vilna and Vitebsk, the southern one from Brest Litovsk along the northern edge of the Pripet Marshes to Bobruisk. The orders of Army Group South were to strike east from Lublin, keeping south of the marshes and aiming at Kiev, from where it was to proceed southeastward along the right bank of the Dnieper. Further to the south, another part of this army group was to attack from Galicia towards Lemberg and, from there, east to Tarnopol.

From the *operativ* point of view, the campaign presented the Germans with some unusual problems. Distances in Russia were much larger than in any of the campaigns fought by the Wehrmacht thus far. Whereas in 1939–40 no enemy capital had been more than 200 miles away from the German starting positions, Leningrad was situated 500 miles from East Prussia and Moscow 650 miles from the river Bug, which served as the Soviet-German frontier in Poland. Rostov on the Don, which Hitler, following the plan of General Marcks, had marked down as the objective of the

advance in the southeast, was even farther away. The Russians' ability to utilize these distances, avoid battle, and withdraw into the depths of their endless country had been demonstrated before, indeed to the point where Clausewitz's concept of the culminating point probably stemmed from his observation of the 1812 campaign in which he had taken part.

To add to the problem of strategic depth, the theater grew laterally as the Germans pressed east, expanding funnel-like from almost 1,000 miles to about 1,500. The terrain was almost entirely flat, though dotted by forests, marshes and, in the north, lakes. With one or two exceptions, the rivers flowed either to the north or to the south. Though currents were seldom very strong, many of them were broad, deep, and marked by steep banks on the eastern side, which made them more difficult to cross in this direction. In this terrain, railways and especially roads were comparatively far between, few in number, and in some ways, of doubtful quality.⁷ Overall, the 579,150 square miles of Soviet territory west of the Leningrad-Moscow-Rostov line gave both sides almost unlimited opportunities to maneuver. For that very reason, it was only by rapid and successful maneuver that the Germans could hope to prevent the enemy from withdrawing and to overcome him in a blitzkrieg campaign.

As the German forces were being assembled in the east—slowly at first and then more rapidly from February 1941, when the real buildup began⁸—the Luftwaffe was still engaged in fighting England. Its first move consisted of an attempt to destroy the Royal Air Force's (RAF) Fighter Command and gain air superiority in order to pave the way for a seaborne invasion. The Luftwaffe was unsuccessful, however, both because the Germans appear to have failed to realize the importance of *sustained* attacks on the opposing radar system and because the RAF, favored by geography that allowed it to withdraw its aircraft beyond the range of the German fighters, was able to dictate the pace of the

battle as it saw fit.⁹ From the end of September 1940, the Germans, confronted by growing opposition, changed their tactics. First, they shifted to daytime bombardment of British “strategic” objectives. When that proved too expensive—again and again in World War II, it was shown that unaccompanied bombers stood little chance against modern fighters—they concentrated on nighttime attacks directed, insofar as any center of gravity can be detected, against aircraft factories and harbors. Britain’s cities, particularly London, Birmingham, Bristol, Cardiff, Liverpool, Glasgow, and Coventry suffered heavily. Nevertheless, the Luftwaffe, its twin-engined light and medium bombers designed for participation in *operativ* warfare and not for waging an independent strategic campaign, never came close to forcing the British to their knees. Indeed, the realization of this fact was one of the factors that finally drove Hitler to decide to turn east.

The Luftwaffe received with mixed feelings the news that Germany was about to invade Russia. Many of its leaders, including Hermann Goering and his deputy, Eberhard Milch, tried to warn Hitler against waging a two-front war because of the inevitable dissipation of forces that would follow.¹⁰ Others, however, expressed relief at the anticipated return from independent “strategic” warfare to the more congenial *operativ* form of war to be waged in conjunction with the rest of the Wehrmacht. “Finally, a real campaign” was the comment of Chief of Staff Hans Jeschonnek.¹¹ Directive No. 21 had charged the Wehrmacht with “destroying the Soviet forces in a rapid campaign” in order to prevent their withdrawal into the interior. Within this general framework, the task of the Luftwaffe was defined as (1) knocking out the Soviet air force in order to obtain and maintain air superiority over the theater of operations; (2) supporting the operations of Army Group Center and, in a more selective form (*Schwerpunktmaessig*, literally “by way of forming centers of gravity”), those of the other army groups; (3) disrupting the Soviet railway net in order to

prevent reinforcement on the one hand and withdrawal on the other; and (4) capturing important transportation bottlenecks such as bridges ahead of friendly forces by using parachutists and gliders.¹² "In order to use all available forces in support of the Army," the directive went on, "the enemy's armaments industry should not be targeted during the main campaign," meaning that the German forces would be directed against the regular Soviet forces rather than at whatever resistance would remain after the destruction of those forces. Only after the end of the mobile phase of operations would attacks on the Soviet armaments industry, chiefly in the Urals, get under way.

In preparation for the campaign, the Luftwaffe divided its forces into three *Luftflotten*. (The forces that operated in support of the Finns in the far north will not be considered here, since there was little opportunity for maneuver warfare there.) Each was clearly earmarked for the support of one army group, although from the command and control point of view, there was no question of subordinating air force units to ground headquarters—but rather only of cooperation between them. In the north, *Luftflotte 1* was commanded by Gen Alfred Keller. His flying units, consisting merely of a single air corps, *Fliegerkorps I*, and a few smaller forces, possessed a total of 592 transport and combat aircraft (453 operational), plus 176 reconnaissance and liaison machines (143 operational). In the center, Field Marshal Albert Kesselring's *Luftflotte 2* was much stronger with two *Fliegerkorps* (II and VIII)—1,367 transport and combat aircraft (994 operational) and 224 reconnaissance and liaison machines (200 operational). Finally, Gen Alexander Loehr's *Luftflotte 4*, with two air corps (*Fliegerkorps IV* and *V*), supported Army Group South. Its forces consisted of transport and combat aircraft (694 operational), plus 239 reconnaissance and liaison machines (208 operational). The total number of combat aircraft (bombers, fighters, and close support) was 2,713, of which 2,080 were operational. Thus, in spite of the huge task with

which it was faced militarily as well as geographically, the German air force in the east had a strength no greater than it had been during the French campaign in the previous year. This reflected the fact that fully one-third of its forces had to be left to fight in the west, the north (Norway), or the Mediterranean; qualitatively, too, the forces on the eastern front were not the most modern since obsolescent aircraft no longer capable of serving against Britain were still considered fit to confront the Soviets.¹³

Throughout the first half of 1941, the Luftwaffe was hard at work preparing for the campaign. The aircraft industry and training facilities were expanded until they were considered able to keep up with anticipated losses, but no more. Luftwaffe units flew numerous photoreconnaissance missions inside Soviet territory, and the list of targets within a 200-mile zone from the frontier had been completed by the end of April 1941. Meanwhile, many new airfields were built and existing ones improved, the necessary ground organization put in place, and the required reserves of POL, ammunition, and equipment assembled. The last stage, starting towards the end of May, was to bring in the flying units themselves under a heavy cloak of secrecy.

In Hitler's own words, the German ability to win this most ambitious of all campaigns rapidly and decisively depended on tanks and aircraft working together in order to "break the Russian."¹⁴ Thus, the importance of a smooth system for air-to-ground cooperation was greater than ever; yet, when hostilities broke out, the organizational problems of securing it had by no means been solved in spite of many suggestions raised by Richthofen and other key Luftwaffe commanders.¹⁵

The system that divided responsibility between the *Kolufits* on the one hand and the *Flivos* on the other remained in force. A process of decentralization took place as both types of officers were increased in numbers until, instead of there being one for each army and corps, one of each could be assigned to every division. Towards the end of 1941, the *Flivos* even started accompanying some individual

regiments, although there were never enough of them to expand this system to the army as a whole.¹⁶ Each air corps (instead of air fleet, as formerly) headquarters now included a *Nahkampfuehrer*. His task was to coordinate all Luftwaffe support for the army, for which purpose he was given operational control over all units available for that mission. Some progress was also made in providing ground and air units with common radio apparatus to enable them to communicate directly with each other. At *Fliegerkorps VIII*, experienced Stuka pilots were now riding in Mark III tanks and acting as forward air controllers. Nevertheless, the German army as a whole still depended on various agreed-on, rather primitive, visual recognition signals to prevent attacks on friendly troops. Above all, Goering steadfastly refused any measures that would have assigned the army any control over the sorties flown by Luftwaffe combat units, and the Germans had to wait until 1944 for a real solution for that problem.¹⁷

Like the Soviet Union in general, the Red Air Force at this time was something of a mystery to the Germans.¹⁸ The chief of intelligence at the Luftwaffe General Staff was Gen Joseph Schmidt, an opinionated officer whose estimates of the situation reflected his Nazi prejudices. He put total enemy strength at approximately 10,500 machines, including 7,500 in Europe. Supposedly the Soviets had 1,360 reconnaissance aircraft and bombers, plus perhaps 2,200 fighters (including those added during the first half of 1941). Most of the machines were supposed (correctly as it turned out) to be inferior to their German equivalents both in general flying characteristics and, to an even greater extent, in specialized instruments such as radio and navigational aids. The Germans assumed the mass of the Soviet air force personnel, including pilots, to be primitive and ill-trained by Western standards and their organization as a whole to be heavy-handed and inflexible. They believed that once the Germans occupied the industrial centers in European Russia, the Soviets would not be able to keep up their

strength in aircraft and would be reduced to fighting in uncoordinated remnants—a belief that turned out to be grossly mistaken.

At 0300, 22 June 1941, the Luftwaffe opened the campaign by the now-standard method of a surprise strike at the enemy's airfields. The weather that day was almost perfect—warm and sunny with a slight haze that cleared up later during the day. For reasons that remain inexplicable to this day, the Soviets had made no preparations to oppose the aggressors. The German pilots found Red aircraft by the hundreds lined up wingtip-to-wingtip on the aprons, and they reported very little opposition on the ground or in the air.¹⁹ According to whether they consisted of bombers, fighters, or dive bombers, German units flew as many as four, five, six, or even eight missions per day—astonishing figures attributable to the simplicity of the machines, the often short distances that had to be covered, the excellence of the ground organization (including a specially developed apparatus that allowed nine aircraft to be refueled simultaneously), and the unparalleled determination of the crews. The first attack was carried out by 637 bombers (including dive bombers) and 231 fighters. Reportedly it hit 31 airfields, three suspected billets of high-level staffs, two barracks, two artillery positions, a bunker system, and an oil depot, all at the cost of two fighters missing. By the evening of the first day, some 1,800 Soviet aircraft were reported destroyed, the great majority on the ground but 322 of them shot down as they rose to meet the German machines. (This disproportion was to prove important later on because Soviet aircrews had not been affected and would survive to fight another day.)

Meanwhile, photoreconnaissance was being conducted on a grand scale. It disclosed the existence of numerous additional airfields, 130 of which were identified and attacked during the next few days. By the end of the first week, the Armed Forces High Command was able to report the destruction of 4,017 Soviet aircraft against a loss of only

150 German ones.²⁰ By 12 July Soviet losses had risen to about 6,850. This included entire bomber squadrons flying obsolescent machines without fighter cover that were shot down like turkeys as they hurled themselves at the invading German columns.

After the first few days, Soviet air operations were reduced to scattered attacks by small numbers of aircraft that appeared out of nowhere, dropped or fired their ordnance, and made off as best they could. Having achieved air superiority to the point that they could command the sky whenever and wherever they wanted, the Germans on 25 June felt that the time had come to shift the center of gravity to support their own ground forces. In so doing, they soon discovered that the number of aircraft available was never really sufficient to cover the vast theater of operations; this in itself made a coordinated system of *operativ* warfare difficult since the constant demands for air support tended to disrupt planning, dissipate the available forces, and hinder the creation of *Schwerpunkte*. Russian roads, often consisting of mere tracks, were difficult to attack because they were usually easy to repair or bypass. Attacks on Russian villages, designed to reduce houses to rubble and thus block the communications passing between them, seldom led to lasting results owing to the wide distances separating the houses and to the wood used in their construction. In the north, as well as on the fringes of the Pripet Marshes, extensive forests enabled even large units, particularly those consisting of infantry or cavalry, to escape observation from the air.

Still, in other ways the Russian countryside offered advantages to the attacker from the air. The density of the railway network was relatively low, there being only 52,000 miles of track (many of them single) in the entire gigantic country. Hence, the task of disrupting the lines and bringing traffic to a standstill did not appear as insoluble as it would have been if the USSR had been a developed Western country with many intersecting, parallel, and redundant

lines of communication and numerous technically advanced facilities for repair and maintenance. In the center and south, the open, flat, almost treeless terrain—much like the American Midwest—made it nearly impossible for ground units to find cover against air attack except by utilizing the occasional ravines. A well-planned campaign should have exploited these advantages and avoided the obstacles. However, this was something that the Germans, operating with only relatively small forces and trying to achieve too many things at once, were never really able to do.

The Luftwaffe's central archives were destroyed at the end of the war, and no good information is forthcoming from the Soviet side. Therefore, what little quantitative data can be found on the impact of the German air attacks on the Soviet ground forces, transportation system, and logistics have to be put together from the scattered surviving records of individual Luftwaffe units. These show that Ju-88 light bombers of a single *Kampfgeschwader* (bomber group) belonging to *Fliegerkorps* II claimed to have destroyed 356 trains and 14 bridges, interrupted railway traffic 322 times, and flown 200 sorties against troop concentrations, barracks, and supply depots in support of Army Group Center in "indirect" operations between 22 June and 9 September. During the same period, and acting in "direct" support of the army, the same unit claimed to have destroyed 30 tanks and 488 motor vehicles in addition to flying some 90 sorties against artillery positions. The Me-110s (twin-engined fighters) of another group claimed to have destroyed only 50 trains and 4 bridges between 22 June and 27 September but compensated by scoring 148 tanks, 166 guns, and 3,280 vehicles of all kinds.

As the records of many ground units show, Soviet opposition in the air during this period was so weak as to be almost negligible. This permitted even single-engined fighters to be diverted away from the escort role to attacking ground targets, and so one *Jagdgeschwader* (fighter group) flying in support of Army Group Center was able to report

142 tanks and armored cars, 16 guns, 34 locomotives, 432 trucks and one train destroyed.²¹ Certain entries in the diary of the chief of the German Army General Staff—who himself relied on information originating in the Luftwaffe—show that these attacks were not without effect on ground operations. On individual occasions, they deprived the Soviet armies of supplies, blocked reinforcements, and created congestion on the Ukrainian railroads in particular.²² However, the available evidence does not permit a detailed reconstruction of the impact of these operations on the campaign as a whole.

In the north, the German ground operations had three aims (fig. 3). They were to surround and cut off the Soviet forces in the Baltic countries (Eighteenth Army on the left), advance on the shortest line to Leningrad (4th Panzer Group in the center), and cover the right flank while keeping in touch with Army Group Center (Sixteenth Army on the right).²³ These diverging objectives, imposed on Army Group North by Hitler himself, are open to criticism; however, because the terrain in this theater, as in Russia as a whole, became more open as the attacking army advanced further toward the east, gaps were bound to appear on the flanks of the advancing spearheads.

The German system of maneuver warfare was by now fully developed. Its consistent aim was to drive deep wedges into the enemy and to encircle his forces (consisting, as of 10 July, of 31 divisions and six independent mechanized brigades grouped together under Soviet Field Marshal Kliment Voroshilov's Northwestern Front). The speed of the advance was spectacular, reaching 40 miles per day during the first few days. Nevertheless, Army Group North never really succeeded in cutting off the main Soviet forces as it had planned to do. Nor did it have the infantry needed to seal what pockets that were formed; many Red Army units, though isolated from each other, remained intact or, at any rate, sufficiently cohesive to continue fighting, especially since the dense forests afforded plenty of room for them to

hide. It fell to the Luftwaffe to leap into the breach and to identify and prevent counterattacks from developing into dangerous threats. This caused its independence to be gradually eroded until finally it was reduced to the role of a mobile fire brigade, just the kind of thing Luftwaffe leaders had always wanted to avoid.

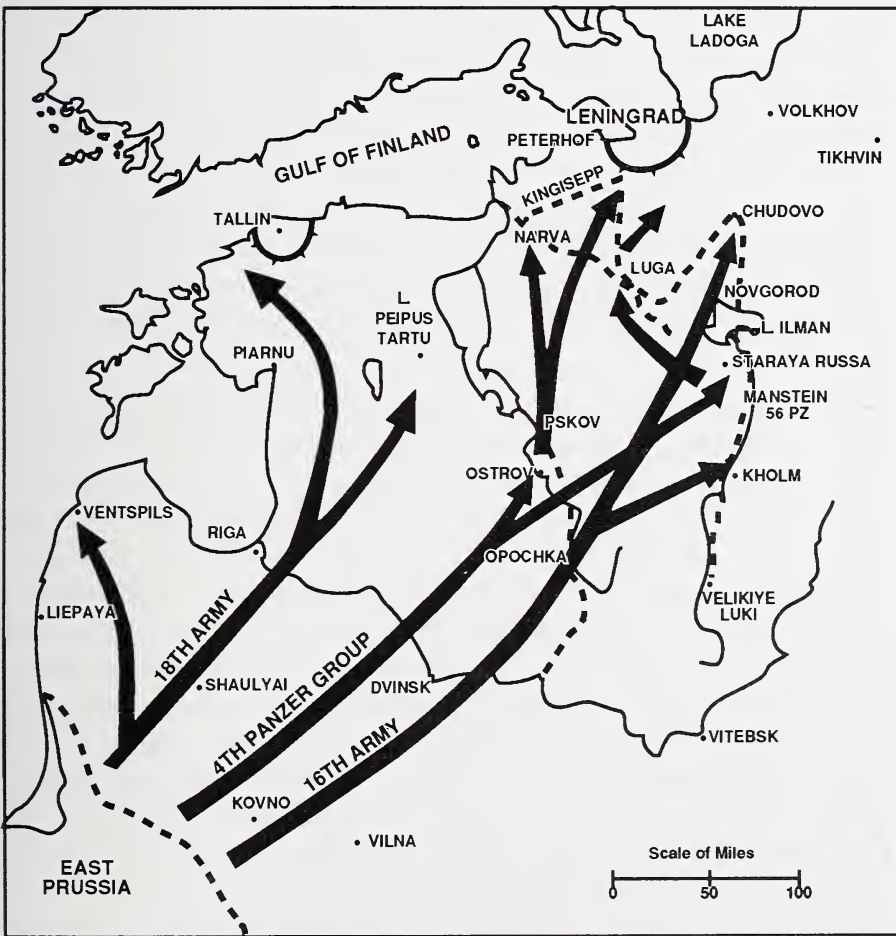


Figure 3. The Leningrad Campaign

For example, on 27 June units of *Fliegerkorps* I were instrumental in beating back a Soviet counteroffensive near Shaulyai (Schaulen), Latvia, where approximately 200 enemy tanks were destroyed.²⁴ On 2 and 3 July the same units first helped breach the fortifications along the old border and then, switching back to *operativ* warfare, attacked the bridges over the Dvina River in order to prevent the Soviets from making good their escape to the northeast.²⁵ In this they were only partly successful. On 6 July it was the turn of the Red Air Force to try and wreck the bridges over the Dvina in order to slow down the German pursuit. This enabled General Keller's *Luftflotte* 1 fighters to shoot down 65 out of 73 attacking aircraft, thus putting an end to large-scale enemy attempts to interfere with ground operations in this sector. Units of *Luftflotte* 1 also assisted in supplying Sixteenth Army during its advance, given the single road (in reality, little better than a forest track) leading from Pskov toward Narva had not yet been cleared and was dominated by isolated Red Army units.²⁶

Thus, during the first two weeks of the campaign, all the ways in which an air force might assist maneuver warfare were displayed to the fullest.²⁷ As flying units were moved forward onto newly captured Soviet airfields, the distances between them and their targets diminished. Beginning in the second week of July, this permitted the *Luftwaffe* to mount repeated attacks on the Moscow-Leningrad railway with the aim of severing communications between Russia's two most important cities.²⁸ Like others after them, however, the Germans were to learn that railways, while not difficult to disrupt, were not difficult to repair.²⁹ Though traffic suffered, the line could not be completely cut until the ground forces had advanced sufficiently to throw a ring around the city.

Beginning in the last week of July, *Luftflotte* 1 was reinforced by Gen Wolfram von Richthofen's *Fliegerkorps* VIII, which was detached from its original assignment to

Army Group Center and brought up to the newly occupied Baltic airfields. Acting in his favorite role as a close-support expert, Richthofen repeatedly massed his forces to deliver concentrated blows at key targets.³⁰ On 15 August they assisted Sixteenth Army in the capture of Novgorod. On 24 August their intervention was decisive in beating back a Soviet counteroffensive against the left wing of Army Group North at Staraya Russa. On 28 August they helped bring the attack on Tallinn (Reval) to a successful conclusion. However, despite repeated attempts and many hits on both warships and freighters,³¹ *Luftflotte 1* was unable to prevent the bulk of the Red Fleet from retreating to Kronstadt and Leningrad. In a sort of mini-Dunkirk, the Soviets succeeded in evacuating some of their troops in the Baltic, and these were later instrumental in the defense of Leningrad.

Fliegerkorps VIII was still available when the offensive against Leningrad got under way on 26 September. Against strong anti-aircraft fire, it helped the units of *Fliegerkorps I* attack targets within the city as well as ships in the harbor; a Soviet counterattack in the direction of Lake Ladoga was beaten off, and the ring around "the capital of Bolshevism" closed. However, only a few days later, Richthofen's units were taken away and sent back to support the offensive of Army Group Center against Moscow. Army Group North itself had now been deprived of the bulk of Fourth Panzer Army, which was also sent to the Moscow area. Relying on a single motorized corps (XXXIX), it was still able to carry out a last offensive effort, crossing the Volkhov River in the direction of Tikhvin, where it hoped to link up with the Finns on the river Svir. Though its aircraft (Ju-88s) were not really suited to the task, especially in view of the densely wooded nature of the terrain, *Fliegerkorps I* flew missions directly supporting the operation as well as attacking railway lines leading into the area. After bitter fighting, Tikhvin fell on 9 November. However, the battle was by no means at an end, and the Germans, finding themselves counterattacked by three Soviet armies under

Gen K. A. Meretskov, were forced to evacuate it a month later. By this time, bad weather, including persistent winter fog, affected the operations of *Luftflotte* 1 to the point where it was unable to reconnoiter effectively, let alone mount coordinated attacks on what targets could still be identified. The operations of Army Group North became essentially static and were destined to remain so until the siege of the city was lifted in January 1944.

In this siege, *Luftflotte* 1, its forces much reduced by losses and by the limited availability of aircraft, was assigned the task of attacking military targets within the city as well as the supply routes leading to it.³² In spite of the reported destruction (by 23 August) of 2,541 enemy aircraft plus 433 probable kills, Soviet opposition began reviving in the autumn, and by the end of the year the city was defended by several hundred fighters, 300 balloons, and 600 antiaircraft artillery barrels. Although the Germans never lost the ability to gain air superiority where and when they wanted, they were unable to make much headway in capturing Leningrad. From September through December 1941, the Luftwaffe dropped a total of 1,500 tons of bombs on targets in and around Leningrad; this was less than the amount dropped by Allied air forces on a single German city in a single night in 1944–45. As a result, the lifeline to Leningrad, which as of 18 November consisted of motor convoys (later a railway as well) crossing over frozen Lake Ladoga, could never be completely severed for any length of time.

As 1941 drew to an end, the troops of *Luftflotte* 1, living under impossible conditions and prevented by the weather from flying much of the time, were drowning their sorrows in alcohol.³³ Meanwhile, far to the south, Army Group South advanced from Poland. Its left wing was formed by Sixth Army, acting as a flank guard against possible counterattacks coming from the Pripet Marshes; next, from north to south, came 1st Panzer Group, Seventeenth Army, and, emerging from Rumania on 2 July, Eleventh Army operating in conjunction with some Rumanian forces (fig. 4). As usual,

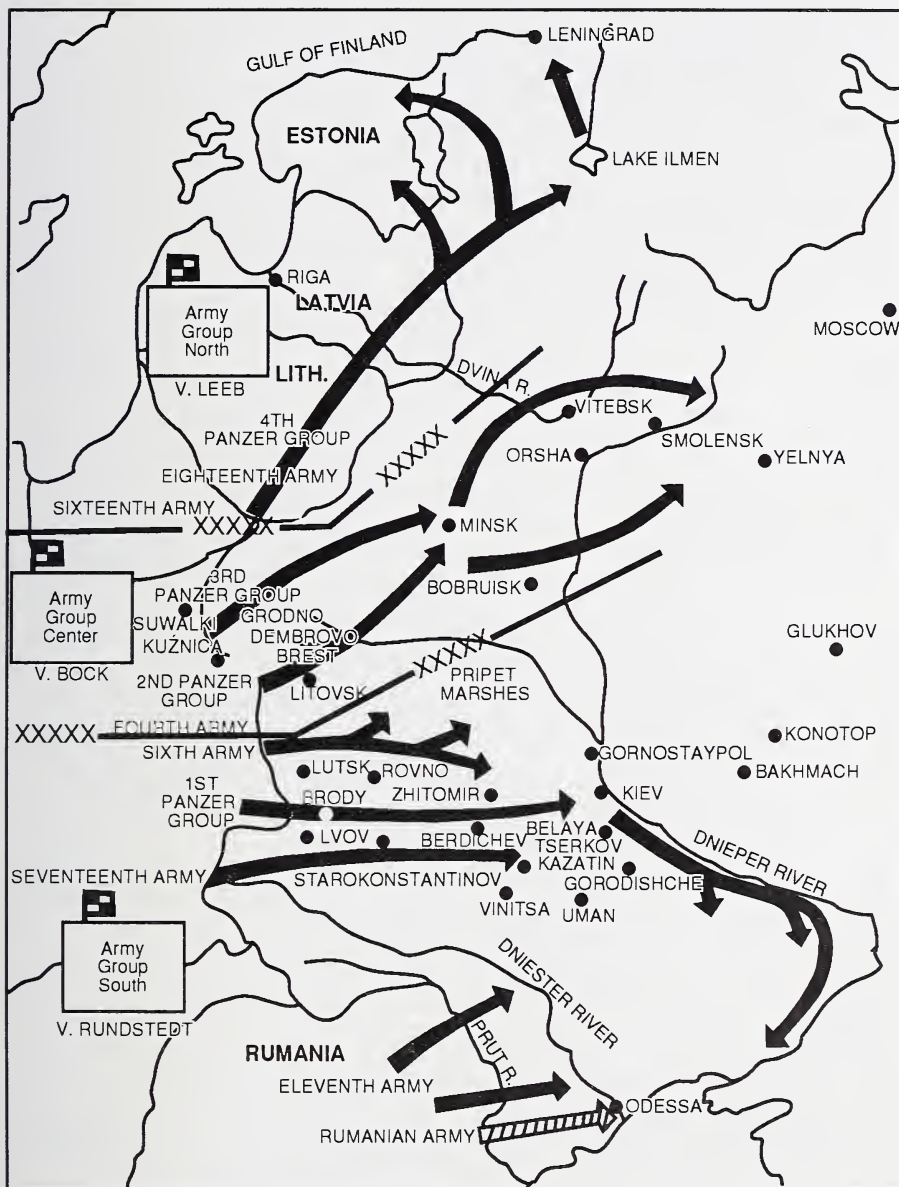


Figure 4. German Operations, 1941

the planners at OKH had staked their main hopes for *operativ* warfare on 1st Panzer Group, though not to the extent of freeing it from subordination to Sixth Army. (Throughout the summer of 1941, German panzer groups continued to be under the orders of infantry armies in order to prevent them from wandering off on their own.) The 1st Panzer Group was expected to break through the frontier defenses and advance very fast, its mission being to outflank the Soviet forces on its right until, by turning southward to the Black Sea, it could crush them in a *Kesselschlacht* against Eleventh Army coming from its Rumanian "balcony." This strategy in turn rendered the south flank of the panzer army open to attack. As always, there were wide gaps between the advancing German columns, and *Fliegerkorps* V had already been instrumental in beating back a corps-sized Soviet counterattack on 26 June in the area between Lutsk and Rovno.³⁴

It soon became clear that the Soviet forces in this area, which formed the Southwestern Front under Gen M. P. Kirponos, were better commanded than elsewhere. In the sector of Seventeenth Army, they slowed down the German advance, did not allow themselves to be disrupted, and, fighting for as long as the situation permitted, made what were on the whole well-ordered retreats (fig. 5). Some of Gen M. I. Potapov's Fifth Army withdrew into the marshes to the north, where the Luftwaffe was unable to find them and from which they were to emerge later in the campaign. Others fell back on the Stalin line and, after that line was breached, tried to cross the Dnieper to safety. It was the task of *Fliegerkorps* V, attached to the left wing of the army group, to prevent the retreat. At first it did so with some success by attacking roads, railroads, and transportation centers in Lvov, Brody, Zlotuv, Zhitomir, Berdicev, Starokonstantinov, Belaya Tserkov, and Kazatin. Other than an occasional thunderstorm, the weather was good and the country completely open. Hence, these attacks, which went on day and night, were as successful as any that the



Figure 5. The Campaign in the Ukraine

Luftwaffe mounted in Russia throughout the campaign. A high point was reached on 30 June when two or three Soviet motorized columns, moving four abreast, were caught near Lvov and subjected to what amounted almost to a slaughter.³⁵ However, *Fliegerkorps V* did not have dive-bombing units under its command. It was instrumental in keeping the air clear of Soviet aircraft, but its ability to offer direct support to First Panzer Army was limited. This was one factor that caused the advance of that unit to be considerably slower at first than had been planned.

Penetrating farther to the east, the Germans faced different problems. Whereas the nature of the terrain in the north had caused the advance to proceed along the forest tracks, the countryside in the Ukraine presented no limitations. Under such circumstances, it did not take long before *Luftflotte 4*, like Army Group South as a whole, found its forces threatened by lack of cohesion. The problem was made worse by the almost complete absence of roads. This caused the army and air force to compete for the few available roadways in order to bring supplies forward. At times it became necessary to supply the forward units of the Luftwaffe by air, always a very costly operation. As a result, the bombers were increasingly left behind, the fighters could not reach the front at all, and only the attack aircraft got proper logistic support. Although bridges on the Dnieper were repeatedly hit by sorties flown by *Fliegerkorps V*, traffic over them was never completely halted because they proved difficult to destroy. Attacks were also made on the railway network east of the river in the Konotop-Glukhov-Gorodishche-Priluki-Bakhmach region. Tactical results were very good, with some 1,000 railroad cars destroyed,³⁶ but again the withdrawal of at least some Soviet forces in front of 1st Panzer Group could not be prevented.

Meanwhile, having reached the Dnieper on 10 July, 1st Panzer Group was forbidden by Hitler from crossing it. Thereupon the Germans turned their armored spearheads towards the southeast, keeping west of the river. This

brought them into the rear of the Soviet armies that were slowly falling back in front of the German Seventeenth Army and led to the creation of the pocket at Uman. Here *Fliegerkorps V* was more successful than before in helping the ground forces seal off the pocket and prevent the escape of the Soviet forces, particularly since it was assisted by units of *Fliegerkorps IV* coming from Rumania in support of the German Eleventh Army. However, this meant that Sixth Army in the north had to be left completely unsupported. That army accordingly had to beat off the Soviet Fifth Army coming out of the Pripet Marshes and directing its attack against the exposed rear of 1st Panzer Group. It did so, but at the cost of slowing its own advance to a snail's pace and thereby laying—even though unintentionally—the foundations for the subsequent vast *Kesselschlacht* of Kiev.

When Army Group South had finished clearing the Uman pocket and was preparing to cross the Dnieper on 7 August, it found itself exposed to a sudden counterattack by the Soviet Twenty-sixth Army on the right flank of the German Sixth Army. This, had it succeeded, might have cut the army group in two or at least driven a deep wedge between the widely separated German forces. As usual, the only force immediately available to hold off the threat was the Luftwaffe; and, as was often the case during this period, it did so quickly and effectively, though at the cost of switching to battlefield operations for which many of its aircraft were not really suitable. A week was to pass before the German forces coming from the north and the south simultaneously (one of 1st Panzer Group's armored divisions had to turn around and retrace its previous movement) were able to halt the Soviets and throw them back across the river. During the first decisive days, *Fliegerkorps V*, throwing in every available unit and forced by unfavorable weather to fly at altitudes as low as 50–100 meters, fought on its own and later claimed to have destroyed 94 tanks and 184 motor vehicles.³⁷

By the middle of August, although isolated pockets of enemy resistance remained, the situation west of the Dnieper could

be regarded as stabilized. From 17 August on, *Luftflotte 4* accordingly moved its efforts farther to the east, hitting the communications center of Dnepropetrovsk day and night in the hope of preventing the Soviets from making further withdrawals and preparing for the Germans' own forthcoming offensive. Owing partly to distance and partly to sheer wear and tear, the number of fighters available to *Fliegerkorps V* was down to 44. Although these fighters performed marvels (on 30 August, there was an announcement that 1,000 Soviet aircraft had been shot down in air-to-air combat), they could not be everywhere at once. Hence, a Soviet attack on the bridge across the Dnieper at Gornostaypol, which the Germans had taken in a coup de main, was successful in delaying the advance of Sixth Army once again. *Fliegerkorps V* was, however, able to protect the first bridgehead built by 1st Panzer Group across the Dnieper on 8 September against determined Soviet attempts to attack it from the air.

Throughout this period, *Fliegerkorps IV*, with its weaker forces, continued to fly missions in support of Eleventh Army, which was approaching the Crimea. It attacked the bridges across the Dniester to prevent Soviet reinforcements and to prevent the escape of Soviet forces from the Uman pocket. The center of gravity gradually shifted eastward until Odessa, used by the Soviets in an attempt to evacuate their forces by sea, became the most important target.³⁸ When the Rumanians crossed the Dniester in the middle of July, *Fliegerkorps IV* typically switched back to close support. The same pattern was thus revealed in this somewhat separate theater as everywhere else. If only because not even Richthofen's close support experts could respond to the army's demands in less than two hours, the Luftwaffe's normal preference was for what the Germans called *operativ* warfare and what we would call behind-the-front interdiction. At least during the early phases of the campaign, close support came into its own only when a clear geographical line divided the forces on both

sides or else when a Soviet counterattack created an emergency.

Even as these operations were going on, the most important part of the drama was taking place neither in the Baltic nor in the Ukraine but with Army Group Center north of the Pripet Marshes in Belorussia. The armored forces, forming the spearheads of the army group, were put on its wings: 3d Panzer Group (Gen Hermann Hoth) on the left and 2d Panzer Group (Gen Heinz Guderian) on the right. Setting out from Suwalki and Brest Litovsk, respectively—the distance separating them was about 200 miles—these spearheads were to converge on Minsk, some 250 miles inside Soviet territory, in order to form a gigantic pocket. Between the two armored spearheads marched the infantry armies—Ninth Army to the north and Fourth Army to the south. This well-thought-out plan, which gave the German forces shorter distances to cover and enabled them to participate in the campaign by sealing off the pocket formed by the armored spearheads, was designed to allow them to form a second and smaller pocket inside the larger one by meeting at a point on the Bialystok-Minsk road some 100 miles to the east of their starting positions. As usual in maneuver warfare, everything depended on speed and boldness in finding the weak spot and then, having burst through it, striking deep into the enemy's rear. As usual, this could only be achieved by presenting to the enemy long, open flanks that the Luftwaffe had the task of holding and protecting.

The starting positions of Guderian's tanks were on the river Bug. As usual, when there was a river to be crossed, the effect was to divert the Luftwaffe units on the spot (*Fliegerkorps* II) from deep strikes to close support, especially since the crossing sites could be dominated by the guns in the ancient fortress of Brest Litovsk. *Fliegerkorps* II was accordingly directed to this task even before it could achieve full air superiority; its "rolling attacks" (*rollende Einsatz*), a kind of operation already familiar from the

Battle of the Meuse in 1940, afforded Guderian's rear echelons a safe passage until the fortress finally surrendered.³⁹ Next, on 23 June units of *Luftflotte 2* were instrumental in beating back a furious Soviet counter-offensive at Grodno. It was only after these operations were over that the weight of the attack could be shifted farther to the east. It now fell on the railroads leading into the area of the prospective pocket (interdiction) and also on the roads leading out of them through the Belorussian forest.

Even at this early point in the campaign, growing distances were already creating a situation where the long-range reconnaissance and bomber units could not be brought up fast enough for the latter to attack targets identified by the former. With the results of photoreconnaissance often many hours out of date, it became necessary to resort to armed reconnaissance by having the bombers act in both roles at once and attack targets of opportunity, a method that proved wasteful in terms of the time that the units could spend on mission. Acting in this way, *Fliegerkorps II* was able to obstruct but not entirely prevent the attempts by forces of the Soviet West Front (Gen D. G. Pavlov) to retreat and break out of the pocket; also, since it could not be everywhere at once, it was unable to intervene against the sorties flown by the Red Air Force against the German cavalry division forming the extreme right flank of Army Group Center.⁴⁰ Further north, *Fliegerkorps VIII* was instrumental in beating off a Soviet counterattack launched against Hoth's flank on 24–25 June in the Kúznica-Odel'sk-Grodno-Dembrovo area. Since roads in this area were few and far between, it also airlifted supplies to the rapidly advanced 3d Panzer Group. By means of all these operations, the Luftwaffe contributed substantially to the closing of the pocket at Minsk, the first great German victory in this new campaign.

The Battle of Minsk was concluded on 3 July, when the Soviet forces inside the pocket formally surrendered, although it was another five days before resistance came to

an end and 290,000 Russian prisoners had fallen into German hands. Meanwhile, the arrival of the infantry had enabled the armor to be disengaged and resupplied. On 9 July, Guderian and Hoth were off again. This time the goal was to close the jaws at Smolensk, 400 miles from the starting positions, thus building another one of those gigantic pockets that were the specialty of the blitzkrieg.⁴¹ The Luftwaffe's principal task was to prevent the Red Air Force from disrupting German preparations for the crossing of the Dnieper, which it did most effectively but not without causing some friendly casualties.⁴² On 23 July the pincers met and trapped a mass of Russians (fig.6). As one might expect from the vast distances, however, the pincers were at first rather thin. The German infantry divisions, though marching hard, had been left far behind by the panzers. Consequently, it again fell to *Luftflotte 2* to do its best to hold the pocket until they could arrive. It did so with only partial success; unlike the French in the previous year, the Russians for the most part did not surrender simply because the map showed that their units had been cut off. Using the wooded terrain to hide during the day, many of them were able to break out at night. Field Marshal Albert Kesselring of *Luftflotte 2* later estimated that 100,000 Soviet troops had made good their escape in this way, albeit at the cost of leaving their heavy equipment behind and watching their large units disintegrate.⁴³

Although it was not until 5 August that the pocket west of Smolensk could be regarded as properly closed—and even then gaps remained—*Fliegerkorps VIII* had already been taken away from *Luftflotte 2*. By Hitler's orders, it joined *Fliegerkorps I* in its attack towards Leningrad. The remaining formation, *Fliegerkorps II*, now found its forces strung out thinly across the hundreds of miles forming the front of Army Group Center and attempting to protect its flanks. It had to assist in sealing off the pocket, but at the same time it had to beat off a series of determined Soviet counterattacks against the exposed Yelnya salient across

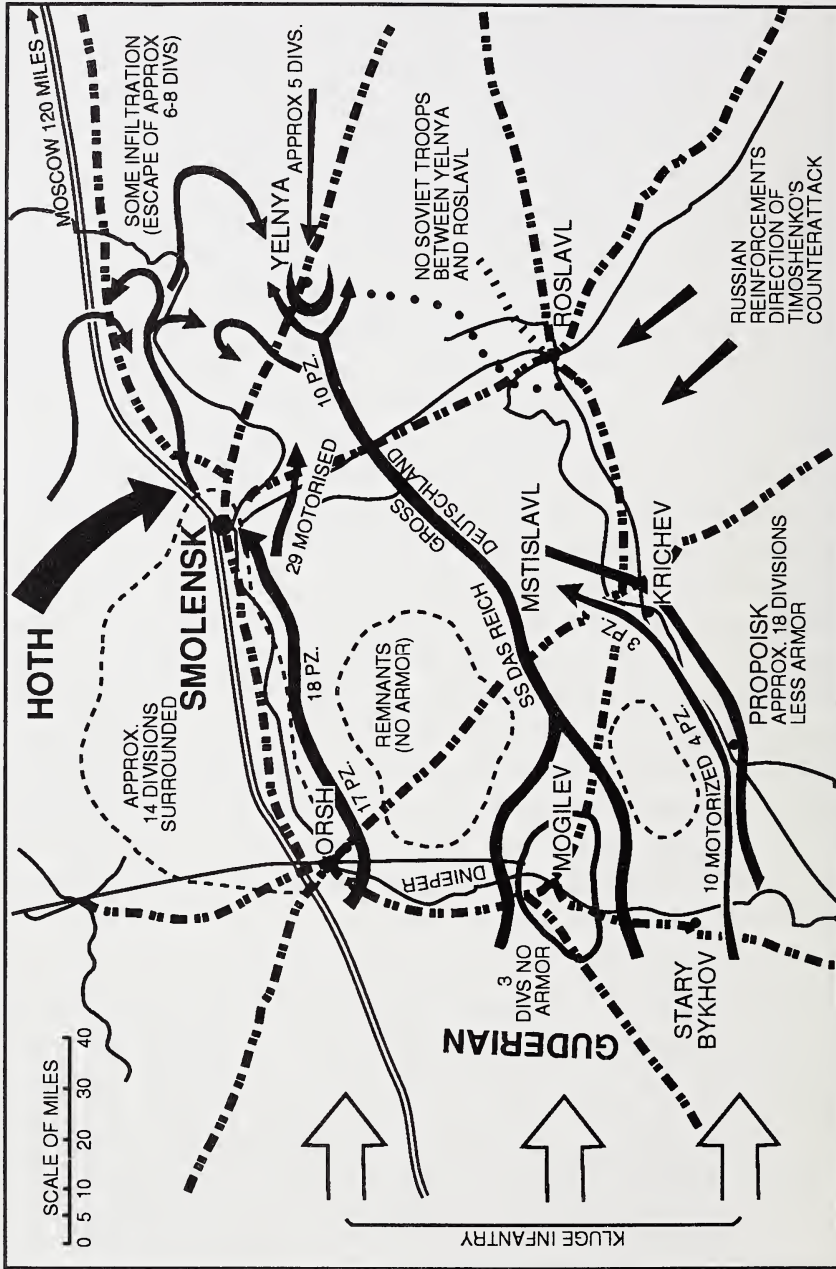


Figure 6. The Campaign of Army Group Center, June-August 1941

the Dnieper (occupied by Guderian's troops). To add to its trouble, it was called upon to operate far in the south, using Stukas to strike at Soviet armored boats that appeared unexpectedly on the northern edges of the Pripet Marshes and inflicted stinging losses on the German cavalry division there. By this time, the Red Air Force had found its bearings to the extent that it was able to join in the army's attacks on the Yelnya salient. Unable to be everywhere at once, the fighters of *Fliegerkorps* II were often too late to interfere. Attempting to pursue the low-flying, heavily armored Soviet attack aircraft, they were fired at from the ground by every possible weapon. As a result, an order went out to the German ground troops to imitate the Soviets and defend themselves against air attack with machine guns. This was OKH's first admission that, in these enormous spaces, the army no longer had nor could hope to have all the friendly command of the air it desired.⁴⁴

As the German forces consolidated their hold at Smolensk on the Dnieper, Hitler and the Army High Command engaged in the famous debate as to which objective, Moscow or the Ukraine, should be given priority. On Hitler's orders, Hoth's 3d Panzer Group now followed *Fliegerkorps* VIII in turning to the assistance of Army Group North, though without much success since the country between Smolensk and Leningrad contains some of the largest and densest forests in the whole of Russia. We cannot debate here whether or not it was feasible, let alone desirable, to pursue the offensive against Moscow at this time. Suffice it to say that this author's research indicates that the logistic basis for this action was not available since the railways supplying the German infantry forces in particular (unlike the armored groups, they did not have their own motorized transport capable of bringing up supplies from the rear) had been left hundreds of miles behind.⁴⁵

Up to this point, the Luftwaffe's task in the east had consisted almost exclusively of *operativ* warfare in indirect or increasingly direct support of the army. Indeed, Hitler's

Directive No. 21 had explicitly ordered attacks on Soviet “strategic” targets such as arms manufacturers to be postponed until *after* the Archangelsk-Volga-Astrakhan line would be reached. However, the need to consolidate the Smolensk pocket, as well as the inability of the German High Command to make up its mind concerning the next objective, created some breathing space. Working day and night, the Luftwaffe brought its ground organization forward, a task that was already being made difficult by the operations of scattered Red Army units as well as the first partisan forces. It was only about 250 miles from the Dnieper to Moscow, making it possible to mount a series of raids against the Soviet capital.⁴⁶ The first and largest attack was launched on the night of 21–22 July and was carried out by 195 bombers; of these, 127 reached their targets and dropped 104 tons of high explosives as well as 46,000 small incendiary bombs. From then until 5 December—the day the final German attack on Moscow opened—75 more raids were mounted, all by night and the great majority by forces numbering fewer than 50 aircraft each.⁴⁷ The 1,000 Soviet anti-aircraft guns concentrated in the city, as well as opposition from Red Air Force fighters, forced the Luftwaffe to operate mainly by night. Even if their bombers had been capable of accurately hitting their targets, which they were not, this was not nearly enough to make an impression. The Soviets later put the total number of dead at 1,088,⁴⁸ comparable to the figure killed at Rotterdam in the previous year but a small fraction of those destroyed by the vast Allied raids on German cities later in the war.

As for maneuver warfare, the raids on Moscow undoubtedly constituted a wasteful diversion of effort away from the main task, which was and remained the destruction of the Soviet armed forces. However, it should be remembered that, owing partly to logistic reasons and partly to the need to clear up the still-seething Smolensk pocket, ground operations on the central front were almost at a standstill at this time. While *Luftflotte 2*'s attack aircraft

took part in preventing the Soviets from breaking out of the pocket, its bombers were not very suitable for this task. They were therefore used on other missions even if the value of those missions proved disappointing in the end. When large-scale *operativ* warfare was resumed late in August, the raids on Moscow continued but were greatly reduced until they only represented a small fraction of the German effort. To the Soviets, they were never more than a nuisance, but they probably did tie down greater forces committed to defending the city than were ever committed to attacking it.

By the end of August, after almost a month of stationary fighting, Army Group Center had its supply situation improved to the extent that the railway supporting its southern flank now reached the city of Gomel.⁴⁹ This enabled Guderian's Panzer Group 2, supported by the newly created Second Army, to start its drive southward into the Ukraine, where it acted in conjunction with Gen Ewald von Kleist's Panzer Group 1 coming up from Kiev. The Germans thought they were operating against only the Soviet Fifth Army; however, the entire enemy force consisted of parts of several other armies as well, so that the operation took longer and yielded far more prisoners and booty than originally expected. As usual, the missions of *Fliegerkorps* II and *Fliegerkorps* V, supporting the two panzer groups, were to gain and maintain air superiority, isolate the pocket against counterattacks from the outside, and attack the encircled Soviet forces until they laid down their arms.

Beginning on 28 August, *Fliegerkorps* II supported Guderian's crossing of the river Desna by blasting away at the Soviet artillery positions on the other side.⁵⁰ It next flew missions against the Soviet railways on Guderian's exposed left flank while using its dive bombers to blast a way for the panzers on their way south, helping them to advance rapidly and preventing the bulk of the Soviet forces from withdrawing.⁵¹ Simultaneously, *Fliegerkorps* V launched attacks on roads and railroads in the Romodan-Poltava area, prevented a counterattack by Soviet forces coming

from the Lubny-Lokhvitsa-Priluki-Yagotin area, helped the army capture Kiev ("to be reduced to rubble and ashes," according to Hitler's order⁵²), and in general bombed the encircled Soviet forces, making them ready for surrender. The war diary of this corps for the period is one of the few documents to survive the war, making a quantitative analysis of these operations possible.⁵³ It shows that the forces of *Fliegerkorps* V flew 1,422 sorties between 12 and 21 September alone, losing 17 aircraft destroyed, 14 damaged, nine soldiers dead, 18 missing, and five wounded. In return, they dropped 577 tons of bombs and 96 cases of incendiaries (presumably over Kiev) and destroyed 65 enemy aircraft in the air and 42 on the ground. They also destroyed 23 tanks; 2,171 motor vehicles; six anti-aircraft batteries; 52 trains; 28 locomotives (this apart from 335 motor vehicles and 36 trains damaged); demolished one bridge; and interrupted 18 railway lines. To the extent that these figures mean anything at all, it seems that the *Schwerpunkt* during this, as during all German mobile operations, was on interdiction; this is indicated by the small number of tanks destroyed as well as the absence from the list of major weapons such as ground artillery.

Meanwhile, along the Dnieper on both sides of Smolensk, the rebuilding of the railways and their conversion to standard gauge was proceeding apace. *Fliegerkorps* VIII, its mission in the north only half accomplished, was brought back under the command of *Luftflotte* 2. Panzer Group 3 was taken from Army Group North and returned to its original position on the left of Army Group Center, where it was subordinated to the Ninth Army; these were thus the same forces that had formed the northern arm in the battles of Minsk and Smolensk. To compensate for the loss of Guderian, Hitler ordered Gen Erich Hoepner's Panzer Group 4 to be used as well. In this way, it operated under the command of Fourth Army at Roslavl on the south flank of Army Group Center, where Guderian had previously been. Meanwhile, Guderian himself was to create a third

prong by driving due north-northwest through Bryansk towards Tula. The German forces now totaled 70 divisions, including four armored and eight motorized; average actual strength was probably around 70 percent, up from 50 percent five weeks earlier. Opposing them were 83 Soviet divisions of the western theater, commanded by Gen Georgi Zhukov. Its principal parts, from north to south, were the West Front, the Reserve Front and, facing Guderian, the Bryansk Front (fig. 7).

Guderian's offensive opened on 30 September, and the remaining German armies following two days later. At first, the new offensive promised to become as successful as anything in the past; on 10 October, forward units of Panzer Group 3 and Panzer Group 4 met at Vyazma, trapping some 300,000 Soviet troops. Meanwhile, Panzer Group 2 (now redesignated Second Panzer Army), operating in conjunction with Second Army on its left, came up from the south and succeeded in working its way behind Gen A. I. Eremenko's Bryansk Front. At this time, the weather broke and the autumn rains began. The entire countryside turned into a vast sea of mud that prevented wheeled vehicles from moving at all and caused tracked ones to move forward only slowly and at an enormous cost in fuel.

As the offensive began, the Luftwaffe's raids on Moscow were reduced in scale until they became of nuisance value only. *Luftflotte 2* went back to its usual role of interdiction behind the front; on 4 and 5 October, it was able to achieve very good results against Soviet rail transport, including the destruction of no fewer than 10 trains loaded with tanks.⁵⁴ However, when the weather broke, it too found itself reduced to flying isolated sorties against such targets as could still be identified. There were even days when the entire air fleet, its ground organization suffering grievously under the impossible conditions, was only able to get one or two reconnaissance aircraft into the air. Red Air Force resistance, favored by prepared airfields and short lines of communications, was stiffening and had to be held down.

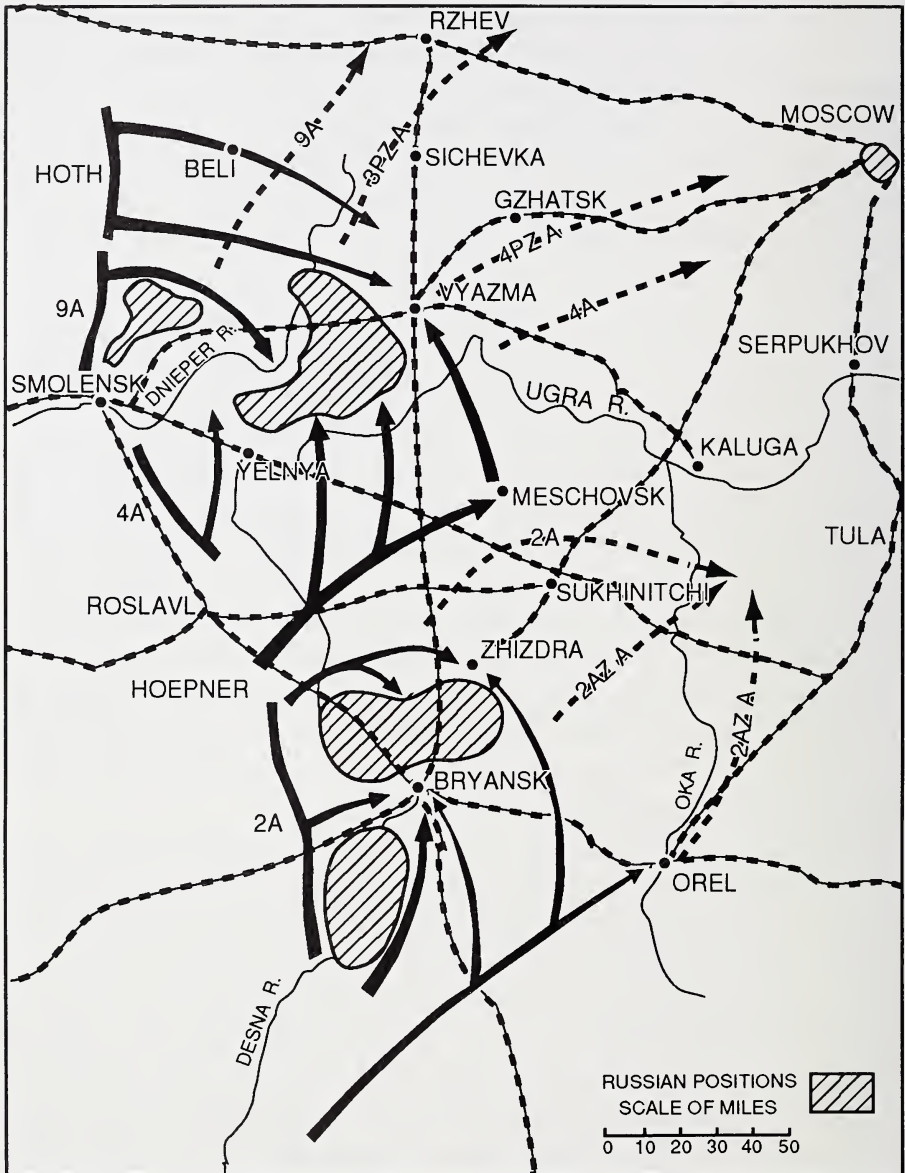


Figure 7. Moscow: The Battles of Vyazma-Bryansk

Under such circumstances, *Fliegerkorps* II was only able to achieve isolated successes, such as preventing a bridge over the river Snopot from being blown up until German armored units could arrive on the scene.⁵⁵ Farther to the south, it was all it could do to keep the supply routes of Second Panzer Army open against the usual remnants of Soviet forces that, though outflanked on the map and supposedly defeated, had not been destroyed. In doing so, it suffered many losses due to the bad weather.

The tremendous German success in the autumn battles had left Hitler and the OKH in an optimistic mood. The double encirclement at Vyazma and Bryansk had yielded as many as 350,000 prisoners, though even this huge figure did not account for many Soviet forces that had made good their escape on the southern part of the front. The continuation of the offensive had originally been ordered for 17 November. However, a few days after this date, the weather brought snow and fog with temperatures sinking to below zero centigrade. *Fliegerkorps* II was taken out of the line and sent to the Mediterranean, where the British had driven Rommel back from Tobruk and were threatening Tripolitania. With them went the commander of *Luftflotte* 2, Field Marshal Albert Kesselring, who was destined to spend the rest of his career commanding the German forces in the Mediterranean theater. All that was left in front of Moscow was *Fliegerkorps* VIII, whose commander, Gen Wolfram von Richthofen, took over from Kesselring on 30 November. By this time, the airfields used by the Germans were scarcely serviceable, and the few units that were still able to advance at all were being overwhelmed by the cold. On 8 December, faced by a massive Soviet counterattack that threatened the flanks of Army Group Center on both sides of Moscow, Hitler reluctantly ordered the offensive to be abandoned.⁵⁶

Seen in retrospect, the German campaign in Russia in 1941 was the greatest display of maneuver warfare in history, and it will likely remain so in the future. In point of preparedness, doctrine, numbers available for the offensive,

and leadership, the German armed forces had peaked during the summer. These qualities enabled them to storm forward, advancing over 600 miles in less than six months while fighting against an opponent who was numerically at least equal, and to conquer territory about twice as large as Germany itself. The key to this unparalleled achievement was *operativ* warfare, now waged with the aid of armored and mechanized units and honed into the blitzkrieg. Its essence consisted of never taking on the enemy in a frontal attack if it could be helped; instead, massive forces were concentrated on very narrow fronts in order to achieve a breakthrough, after which they would move forward to drive deep wedges into the enemy, pulverize (*zerstueckeln*), outflank, encircle, and annihilate him in a *Kesselschlacht* with inverted fronts whenever possible. Coordinated mobility, even more than firepower, formed the key to this method of warfare, and indeed the entire German system of organization and C³ were specifically designed to assist large separated forces in coordinating their movements against a single enemy. As a glance at the map shows, the campaign consisted of first breaking up the enemy front into separate sectors and then building a series of huge cauldrons, each of which contained several hundred thousand Red Army troops (fig. 8). In point of sheer operational brilliance, it has no parallel.

This above does not mean that the German conduct of the war, even if narrowed down to the 1941 campaign alone and even if regarded from a purely *operativ* standpoint, was perfect. Having underestimated both the power of their opponents and the difficulties posed by distance, terrain, and climate, the Germans did not have sufficient troops for the campaign and logistically their preparations for it were rather sketchy.⁵⁷ Once the invasion got under way, the funnel shape of the theater of war meant that the number of objectives was forever increasing. This should have acted as a spur to the German High Command (Hitler in particular) to decide priorities and to create *Schwerpunkte*. Instead,

they often chose to scatter their forces and “send them off along a growing number of diverging axes in order to, from left to right (or north to south), link up with the Finns, capture Leningrad,” keep in touch with Army Group Center, capture Moscow, keep in touch with Army Group South, overrun the Ukraine, and invade the Crimea. Whether the Germans could have won the war by imitating Napoléon and marching straight for Moscow is doubtful, given that the fall

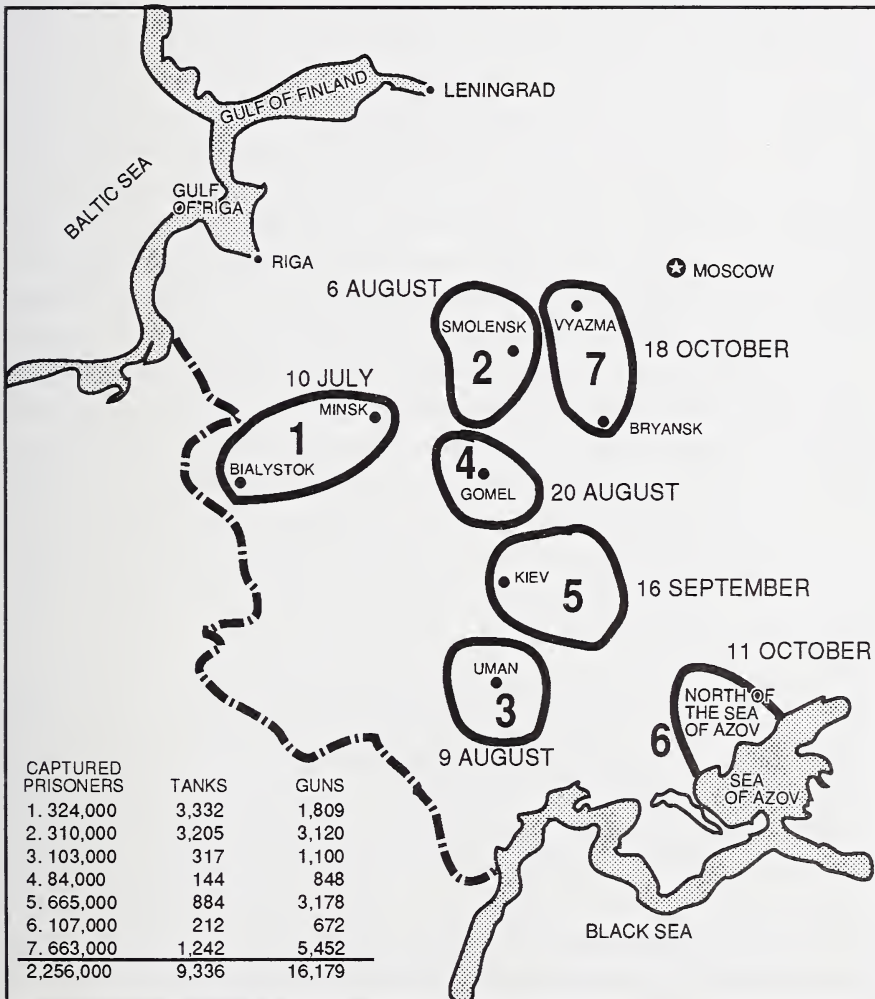


Figure 8. Battles of Encirclement of the Eastern Campaign, 1941

of the city would not necessarily have caused the Soviet Union to break up.⁵⁸ Also, it is not clear whether such a thrust could have been logistically supported using the road system in Belorussia.⁵⁹ As it was, this strategy was never put to the test.

As these pages have shown, the contribution that the Luftwaffe made to the campaign was enormous. It was able to secure air superiority and protect friendly forces against attack, although its ability to carry out the latter mission diminished as time passed. Next, its forces used every means at its disposal to help the army move forward. Luftwaffe units reconnoitered the enemy ahead of the army and often helped the latter's commanders decide on the best direction in which to mount their *operativ* thrusts. They flew supplies to army units that could not be reached in any other way. They protected the long, exposed flanks that naturally resulted from the blitzkrieg style of war, forming *Schwerpunkte* wherever and whenever the enemy showed signs of preparing a counterattack. They helped prevent the withdrawal of trapped Soviet forces and launched punishing attacks on those that had been cut off inside the pockets created by the army's *operativ* thrusts. Whenever a river was to be crossed or an important city to be captured, the Luftwaffe was certain to be found flying close-support missions even to the point where it literally dropped its bombs at the German infantryman's feet.

Though the achievements of the Luftwaffe were thus considerable, it became increasingly clear that the available forces were not really sufficient to master the enormous spaces involved. This was particularly true in view of the equally enormous difficulties involved in having to operate from bases that were primitive, far from home, and often connected to each other, the rear, and the ground forces only by the most tenuous of communications. The farther east the Germans went, the more difficult it became to keep the Luftwaffe units supplied and their aircraft operational. The more intensive the fighting, the greater the army's tendency

to call in the air force wherever an advance was to be made or whenever a local crisis took place. This combination of circumstances had the effect of gradually bringing *operativ* warfare to an end. The Luftwaffe was forced more and more to act as flying artillery, a role for which the majority of its aircraft were not well suited and in which they took correspondingly heavy losses.

In Russia, as in Poland and France, the Luftwaffe was originally forbidden from attacking strategic targets, it being assumed that such attacks would be a waste of effort and that the campaign hopefully would be over before the effects of such attacks could be felt. However, just as the army tended to divide its efforts between many objectives, so the Luftwaffe had to go beyond this strict line of reasoning. Beginning in the second half of July, some of its forces were diverted from interdiction in order to attack industrial targets in Moscow, Kharkov, Rostov, Orel, Tula, Voronezh, Bryansk, and a number of other places. In the absence of a heavy four-engined bomber fleet (which, given their overall economic situation, the Germans probably could not have created even if the necessary prototypes had been available), strategic warfare had to be carried out by two-engined medium and light bombers. However, even these were only capable of hitting individual targets more or less by accident.

It is therefore not surprising that such warfare remained without any noticeable effect, of nuisance value at best and a waste of resources at worst. The only thing that can be said in its favor is that it probably did not seriously impact on whatever chances the Germans stood to gain a victory, given that during the would-be decisive advance on Moscow the effort that went to operations other than *mittelbare* (indirect) and *unmittelbare Unterstuetzung* (direct support) was not very great.

All in all, the strengths and weaknesses of the Luftwaffe in this period reflected those of the German armed forces as a whole. Unequalled determination and sheer *Schwung* (élan) was based on the unlimited *Einsatzbereitschaft*

(initiative) of air crews and ground personnel. The Germans were unmatched in their grasp of *operativ* warfare, but only at the expense of weaknesses in logistics (sustainability in particular) and a somewhat uncertain overall strategy that caused them to go after too many different objectives at once. As the twentieth century draws to an end, there is still much to learn from the Luftwaffe's methods of waging war. There is also much to avoid.

Notes

1. For an account of "ideological" versus "strategic" factors in Hitler's decision to invade the Soviet Union, see Andreas Hillgruber, *Hitlers Strategie: Politik und Kriegfuehrung, 1940-1941* (Frankfurt am Main: Bernhard und Graefe, 1965), 564-78.

2. Hitler had originally expected the war for *Lebensraum* to come no earlier than 1943-45; see the so-called Hossbach Memorandum, 5 November 1937, printed in *Documents on German Foreign Policy* (London: H. M. Stationery Office, 1949), series D, vol. 1, no. 19, 29-30.

3. Franz Halder, *Kriegstagebuch* (Stuttgart: Kohlhammer, 1962), vol. 2, 49.

4. See, however, Martin van Creveld, *Hitler's Strategy 1940-1941: The Balkan Clue* (London: Cambridge University Press, 1973), 69ff.

5. For these strategic debates, see especially Albert Seaton, *The Russo-German War, 1941-1945* (London: Weidenfeld and Nicolson, 1971), chap. 4.

6. For the text, see H. R. Trevor-Roper, *Hitler's War Directives, 1939-1945* (London: Sidwick and Jackson, 1964), 49-52.

7. The quality of the Russian roads was, and remains, notorious; among those shown on German maps, some turned out to be mere unpaved tracks whereas others did not exist at all. The railroads were better, but the tracks were wider than the international standard and the lines unsuited to German trains in some other ways as well. See Martin van Creveld, *Supplying War: Logistics from Wallenstein to Patton* (Cambridge Mass.: Harvard University Press, 1985), 153, 155-57.

8. For the details, see van Creveld, *Hitler's Strategy*, 164ff.

9. See Richard Hough and Denis Richards, *The Battle of Britain: The Greatest Air Battle of World War II* (New York: Norton, 1990), 250-51, 309-10.

10. Matthew Cooper, *The German Air Force, 1933-1945: An Anatomy of Failure* (London: Jane's, 1981), 218-19; Hermann Plocher, *The German Air Force versus Russia, 1941*, USAF Historical Study 153 (Maxwell AFB, Ala.: USAF Historical Division, Air University, 1965), 6-7.

11. Quoted in Horst Boog et al., *Das deutsche Reich und der Zweite Weltkrieg*, vol. 4, *Der Angriff auf die Sowjetunion* (Stuttgart: Deutsche Verlags-Anstalt, 1983), 286.

12. This task was later omitted following the heavy losses suffered by the airborne troops in the battle of Crete.

13. For the German order of battle, see Boog, vol. 4, 307ff.

14. Halder, vol. 2, 336, entry for 30 March 1941.

15. See R. R. Muller, "The German Air Force and the Campaign against the Soviet Union" (PhD diss., Ohio State University, 1990), 80ff.

16. See XLII. Armeekorps, Ia, "Erfahrungsbericht ueber den Einsatz des Flieger-Verbindungsoffiziers," German military records (hereinafter cited as GMR), in the Collection of Seized Enemy Records, 1941-, Record Group 242, National Archives, Washington, D.C. (microfilm), Microfilm Publication T-314, roll 997, frame 000114 (T-314/997/000114).

17. *Ibid.*, 85.

18. See Boog, 290ff. and Plocher, 16ff.

19. See, for example, the account by one young Me-109 pilot: Franz Kurowski, *Balkenkreuz und roter Stern: der Luftkrieg ueber Russland, 1941-1944* (Friedberg: Podzun, 1984), 57; also a Colonel von Riesen, quoted in Klaus Uebe, *Russian Reactions to German Airpower in World War II*, USAF Historical Study 176 (Maxwell AFB, Ala.: USAF Historical Division, 1964), 41-42.

20. Figures from Plocher, 41; for a detailed analysis of the attack, see also Generalstab der Luftwaffe, 8. (Kriegswissenschaftliche) Abteilung, "Der Luftkrieg im Osten," GMR/T-971/18/000795ff.

21. Cooper, 226.

22. Halder, vol. 3, 56, 61, 64, 67, entries for 9, 10, 11, and 12 July 1941.

23. Seaton, 102ff.

24. Boog, 663ff.

25. Plocher, 144; also see "Kriegschronik des Kampfgeschwader 'Hindenburg'," GMR, T-971/50/41.

26. Plocher, 145.

27. The Germans in Russia did not, however, employ gliders and parachutists to seize objectives ahead of the army. Following the heavy losses suffered by the airborne troops in Crete, it was felt that such descents were too vulnerable to Soviet counterattacks; instead, the role of can openers fell to commando units that used underhand means in order to carry out coups de main. See David Thomas, "The Importance of Commando Operations in Modern Warfare, 1939-82," *Journal of Contemporary History* 18 (October 1983): 639.

28. "Kriegschronik des Kampfgeschwader 'Hindenburg'," GMR, T-971/50/42.

29. Uebe, 85.

30. See *Europäische Beiträge zur Geschichte des Zweiten Weltkriegs*, Heft (book) 1, "Die Deutsche Luftwaffe im Kriege gegen Russland, 1941–1945," *ibid.*, T-971/26/000001ff./8.

31. For details see Generalstab der Luftwaffe, 8. (Kriegswissenschaftliche) Abteilung, "Der Luftkrieg im Osten, 1941," *ibid.*, T-971/18/000795ff./18; also "Kriegschronik des Kampfgeschwader 'Hindenberg,'" 45.

32. "Kriegschronik des Kampfgeschwader 'Hindenberg,'" 46.

33. *Ibid.*, 50.

34. See Plocher, 52–53, for details.

35. "Der Luftkrieg im Osten, 1941," 15; and Plocher, 54.

36. Plocher, 59.

37. *Ibid.*, 72–73.

38. *Ibid.*, 16.

39. "Der Luftkrieg im Osten, 1941," 3; and Plocher, 87.

40. Seaton, 121.

41. The commander of Army Group Center had originally wanted to make Smolensk his first objective, so that there would have been one pocket instead of three. Hitler, however, regarded this as overly ambitious, and, given the Germans' subsequent difficulties in preventing Soviet breakouts, one can only conclude he was right. See Heinz Guderian, *Panzer Leader* (London: Joseph, 1953), 158–66; and Hermann Hoth, *Panzeroperationen* (Heidelberg: Vowinkel, 1956), 51, 62.

42. Guderian, xxx.

43. Boog, 659; and Albert Kesselring, *Kesselring: A Soldier's Record* (New York: William Morrow and Co., 1954), 100.

44. As early as the middle of July, the chief of the Army General Staff noted that Soviet air activity was reviving and that German air superiority at all times and places was no longer assured. Halder, vol. 3, 85, 102, entries for 17 July and 22 July 1941; Plocher, 103.

45. See van Creveld, *Supplying War*, 166ff.

46. Hitler's order for mounting the raids was contained in "Directive No. 33" of 19 July 1941, printed in H. R. Trevor-Roper, ed., *Hitler's War Directives, 1939–1945* (London: Sidwick and Jackson, 1964), 139–45.

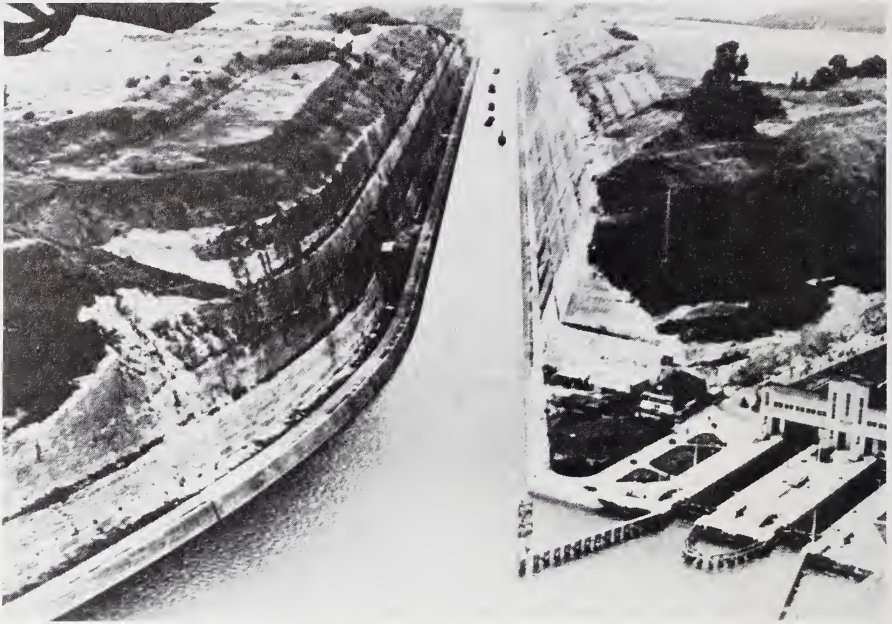
47. For details, see Boog, 693.

48. Henry C. Cassidy, *Moscow Dateline, 1941–1943* (Boston: Houghton Mifflin, 1943), 94. The figure may be unreliable, however, as the same source, quoting the chairman of the Moscow Soviet, puts the number of German aircraft downed over the city at no less than 1,100.

49. See van Creveld, *Supplying War*, 170–71, and Boog, 978–79, for the details of the German supply situation at this time.

50. Plocher, 133. As so often, after-action investigations showed that the Stukas had been less accurate than expected and that the defenders had not been seriously hit; all the Luftwaffe was really able to do was to force them to keep their heads down. See also Uebe, 70.

51. Guderian, xx.
52. Halder, vol. 3, 186, entry for 8 August 1941.
53. Plocher, 131–32.
54. “Der Luftkrieg im Osten,” 13.
55. Ibid.
56. See Percy Ernst Schramm, ed., *Kriegstagebuch des Oberkommando der Wehrmacht* (Frankfurt am Main: Bernard und Graefe, 1965), vol. 1, 1081, entry for 8 December 1941.
57. See especially Boog, 959–88.
58. Seaton, 214–15.
59. See van Creveld, *Supplying War*, 176.



Fort Eben Emael (left) guards the Albert Canal and the Maas River (center and lower right, respectively).



The Ju-87 Stuka dive bomber was a very effective weapon in the German blitzkrieg warfare in France, the Low Countries, Poland, and the Soviet Union.



The Ju-88 was a versatile bomber that played an important role in German offensives.



Gen Wolfram Freiherr von Richt-hofen, commander of *Fliegerkorps* VIII and cousin of the famed World War I ace, observes a Stuka attack with Gen Hans Hube, a panzer commander.



Gen Robert Ritter von Greim (left), commander of *Fliegerkorps* V, meets with Gen Hans Jeschonnek, chief of the Luftwaffe General Staff.



The Luftwaffe's initial attack on the Soviet Union wrought havoc on the unprotected aircraft of the Red Air Force.



Russian supply lines and rail movement of petroleum, oil, and lubricants were air interdiction targets in the early stages of Operation Barbarossa.



A Bf-110 lands at a recently captured Russian airfield. The Luftwaffe was able to use such airfields immediately after they fell to advancing panzer spearheads.



German gun emplacements near Vyazma-Gradina. Beyond them is the vast, treeless expanse of the Russian landscape.



Fall rains and spring thaws caused the *rasputitsy* ("times without roads"), during which Russian roads became quagmires.



General von Richthofen at the field headquarters of *Fliegerkorps* VIII.



Aircraft of *Fliegerkorps* IV provide a screen for advancing panzers.



The Soviets emphasized the use of combined arms and rapid movement (above) to pierce the enemy front and then to encircle, disrupt, and capture or destroy the enemy's forces (below).





An Israeli armored column, October 1973.



VII Corps massing for battle. The 3d Armored Division prepares to move into Iraq, 24 February 1991.

Chapter 4

Maneuver Warfare in Action

The Soviet Version

The second military with extensive experience in maneuver warfare and the operational art is the Soviet one. The Soviet military is, or at any rate was, of obvious interest. They have been and, if reconstituted, could once again become America's principal opponent, or at least a major player in the international strategic arena. Though Soviet equipment and doctrine have been widely exported, it should be explicitly noted that no third world country has developed the expertise to exercise and orchestrate Soviet operational practice. Many such countries have gained political advantage by holding large tank inventories. Militarily, however, few have done much more than drive these vehicles about.

Though the cold war may be dead and buried, there are four reasons why Soviet ideas on, and experience with, maneuver warfare remain of military and intellectual interest. First, the Soviets, like the Germans, managed to generate very high firepower (both infantry and artillery) while still maintaining a relatively small logistic infrastructure and small, lean units.¹ Second, unlike most Western armies (the German one in particular), they were able to practice maneuver warfare even *without* possessing the high-quality manpower and low-level tactical excellence that are normally considered essential for the purpose. Third, in maneuver warfare as well as elsewhere, the Soviet approach to command, control, communications, and intelligence (C³I) was centralized rather than decentralized.² Fourth, the scale, sweep, and rates of advance of their operations (table 3) were without equal in history. In 1945, they deployed 560 divisions along a front of 3,200 kilometers as compared to 91 Anglo-American divisions deployed along

a front of 400 kilometers.³ The Vistula-Oder operations took only three weeks to cover a distance equal to that between the old East-West German border and London, and the rate of advance in their Manchurian operation was even higher. These operations give some measure of the scope of Soviet maneuver warfare and of the speed with which relevant forces, should they be reconstituted, might again appear on the Oder. Those interested in making maneuver warfare work must study Soviet maneuver warfare operations.

This chapter first of all outlines the peculiar historical circumstances that gave rise to the Soviet system of operational warfare. Next, it examines the scientific basis of Soviet maneuver warfare and its cardinal principles, including some that pertain to air power. Next, the chapter discusses the evolution of Soviet operational methods during World War II in terms of the three grand phases: initial defense, the shift to the defensive-offensive mode of war, and the grand offenses thereafter. The concluding section analyzes the role played by the Red Air Force in the maneuver scheme.

Table 3

**Rates of Advance of Tank Armies in the Third
Period of the Great Patriotic War (GPW)**

Campaign	Army	Depth of Advance in km	Max Rate km per 24 hrs
Lvov-Sandomir	1GTA*	400	60
	3GTA	300	60
	4GTA	350	55
Vistula-Oder	1GTA	610	75
	2GTA	705	90
	3GTA	480	50
	4TA	400	60
Berlin	1GTA	110	20
	2GTA	130	25
	3GTA	130	50
	4GTA	170	50

*GTA = Guards Tank Army

Source: Christopher N. Donnelly, *Red Banner: The Soviet Military System in Peace and War* (London: Jane's Information Group, 1988), 226.

An issue of intellectual concern that also serves as the backdrop for appraising Soviet operational practice is the question, Who fathered deep-operation warfare? Was it Heinz Guderian, as has been frequently claimed in the West, or was it M. N. Tukhachevsky, as was claimed in the USSR and by some Western analysts? In fact, both men began by rejecting the indecisive conflict manifested in World War I and the futility of merely pushing the enemy back. Tukhachevsky was the most prominent of a group of young czarist officers who rose quickly to the very top in the chaos of the early Bolshevik period. Guderian was the insightful technician who amalgamated the emerged technology of the period. With his jaeger infantry and signals background, he pulled together tank, fighter, and signals to forge a diverse combined arms team.⁴ His task was to develop a means to transform the German infiltration/ penetration tactical skills developed in 1917–18 into a larger operational framework. The operational framework in which he embedded his technical innovations had existed since Helmuth von Moltke revitalized the General Staff in the 1860s.

By the late nineteenth century, and as demonstrated most convincingly in the Boer War and Russo-Japanese War (1899–1902 and 1904–5, respectively), new technologies had caused infantry to go to ground. The Germans in 1870–71 had learned that firepower prevented Napoleonic column tactics, (i.e., frontal attacks). But advances by overlapping infantry on external lines (where the enemy is pinned to the front while one's own flanks are extended to creep around the pinned defender) remained possible, and so did maneuvers with separate corps in the Napoleonic manner. These considerations led German planners to the Schlieffen Plan of 1914, which was essentially an attempt to apply the lessons of 1870–71 on a larger scale. When that maneuver failed, trench warfare made its appearance from Switzerland to the English Channel. Flanks disappeared, and warfare became static. Firepower in the form of artillery and machine guns dominated the attack and the defense. As

related in a previous chapter, the Germans subsequently learned to cope with firepower by developing high-quality *Stosstruppen* (shock-troop) infiltration tactics for the attack. The role of cavalry in all this was zero.

By contrast, on the vast Eastern Front in World War I, continuous static fronts never really took hold. However long and elaborate a defensive system, its flanks were almost always open and hence susceptible to being turned by wide, sweeping movements. Advances of scores of miles in an offensive were common; even advances of a hundred or more miles took place on occasion. Thus, while the Western Front was tactically oriented and the pace so slow as to preclude a transition to the operational level, on the Eastern Front operational goals were preeminent. The Russians never felt the need to develop German-style shock troops and infiltration tactics; given the low levels of training and education characteristic of the czarist rank and file (including the critically important noncommissioned officer corps), it is questionable whether they could have done so even if they had tried. Be that as it may, it was never and still is not the Soviet operational style.

In 1914, German generals Paul von Hindenburg and Erich Ludendorff won the Battle of Tannenberg—the modern Cannae—and thereby exemplified maneuver warfare at its superb best. This was followed by a whole series of other successful maneuver operations including the Battle of the Masurian Lakes, the Gorlice-Tarnow breakthrough of 1915, and—on the Russian side—the Brusilov offensive of 1916. While the fortunes of war swung in either direction, all these campaigns showed that on the Eastern Front, as distinct from the western one, large-scale operational maneuver warfare such as had been practiced by Moltke (and in the American Civil War by Robert E. Lee) was far from dead. Indeed, so vast were the spaces over which the war unfolded, and consequently so thin on the ground the modern weapons needed to saturate them with defensive firepower, that even cavalry was able to play a useful role.

Against this background, Soviet-style operational art had its origins after World War I (e.g., in the Russian Civil War, during foreign intervention, and in the Polish wars of 1917–20).⁵ In these wars, the Soviets successfully developed a fluid style of war dominated by an offensively oriented mobile arm in the form of cavalry sweeps. True, infantry remained the main arm; it was still indispensable on the defense, and a strong infantry center remained the prerequisite for cavalry envelopments against stronger opponents. Neglect of this historical maxim and “interworking of arms” (the Soviet meaning of combined arms) led to defeat in a war against Poland that up to that point had been successful. As the Soviet cavalry pincers were about to close, the Poles attacked through the weakly held center and unhinged the Russian offensive in a classic maneuver on internal lines. This turn of events “mesmerized the Red commanders for a decade.”⁶

Cavalry was ill suited for defense or for launching frontal attacks against entrenched infantry. It was eminently suited as a strike arm for deep raids and also for rushing from sector to sector as an operational reserve to cope sequentially with uncoordinated opponents. In some respects, this use of cavalry was a reversion to an earlier period when forces were small relative to spaces in which they operated and the firepower content of the battle was low. Put in other words, what was valid for the Russian Civil War would not have been valid only a few years earlier against well-supported regular forces and was totally outdated in the West.

The USSR’s Marxist-Leninist leaders, civilian as well as military, have always prided themselves on their use of the dialectic method and its solid scientific basis in the study of history. Hence, just as they were to do for the Great Patriotic War (World War II), they dissected their Civil War experience and generalized it into a new appreciation of warfare on a grand scale with a particular affinity for deep

operations well behind the opponent's principal forces. According to Christopher Donnelly,

analysis of "front" [army group] and "army" [corps] operations of that period was incorporated into a field manual in 1924 and into the Field Regulations of 1925 and 1929. The term "operational art" was first used in 1922, and the division of Soviet military art into strategy, operational art, and tactics was laid down officially in 1926. The development of the theory of "deep operation" during the 1930s is seen as the major conceptual development of Soviet military art between the wars. The 1941-45 war saw the development of operational concepts for army and front, air and naval operations, and their associated air defence.⁷

Nevertheless, the Soviets did realize that their experience had to some extent been an anomaly. While they tended to berate Western commanders for their unimaginative operations in France, they were aware of the differences between their own and Western forces and in the force-to-space ratios involved. They were proud of their achievements with mobile cavalry but recognized that the horse would have to be replaced eventually by the internal-combustion engine. The horse could not operate in a firepower-swept environment; the tank could. The need to protect the proletarian revolution by possessing an industrial base capable of producing the new weapons of war was perhaps the major motivator underlying Stalin's crash industrial programs and five-year plans.

In 1922, the Treaty of Rapallo between Germany and the Soviet Union gave the Soviets a chance to work with the Germans and to gain a firsthand look at German armaments technology, particularly the tanks and aircraft that the Germans themselves were forbidden to have. Until Adolf Hitler ended it in 1933, this arrangement also exposed the Soviets to German experiences and doctrinal ideas. However, the guiding operational framework for both the Germans and the Soviets had already been set. Soviet officers like Tukhachevsky who came into contact with the Germans were much impressed by German military techniques;⁸ nevertheless, documents such as the *Field*

Regulations of the Red Army, 1929 suggest that the German influence was minimal.⁹ And contrary to what is sometimes claimed by Soviet apologists, the Soviet experience was not germane to German needs and seemed quaint.¹⁰ For the Germans, cavalry was no longer a serious arm. Indeed, the principal technological innovation of the Russian Civil War—the so-called *Tachanka*, which was a machine gun team mounted on a fast, horse-drawn carriage—itself illustrates the regressive qualities of the Soviet experience. Still, although their respective versions of deep operations were developed from opposite ends, Soviet and German methods converge and have many similarities. As Col V. Y. Savkin writes:

Military actions during the period of foreign intervention and civil war (1917–20) were an important phase in the development of principles of military art. They were conducted on a weak economic base, in the absence of new military-technological means, and [at] an enormous deficiency in trained commanders. Red Army operations . . . were distinguished from operations during the period of World War I by the decisiveness of goals, low operational and tactical densities, great scope and creative application of the principles of massing, activeness, surprise, and mobility.¹¹

Accordingly, the Russian Civil War experience, while ethnocentric, did lay the foundations for the development of a concept of “deep operations,” one on which the leading theoreticians were to base their projections in the late 1920s. The idea that a lightning thrust, splitting or outflanking major enemy groupings and penetrating into the enemy’s deep rear, could accomplish a rapid military and political collapse of the enemy became a key theme in Soviet operational and strategic thinking and remains so to this day.¹²

Air power played little part in the wars of 1917–20. The aircraft available to the Soviets and their opponents were scarce in number, primitive, short-ranged, and difficult to maintain. Their main use was probably for reconnaissance, although their limited firepower was enough to wreak havoc

upon cavalry caught in the open. The role of logistics was also limited during this formative period. Demands upon artillery resupply were light; in the immense, flat, and sparsely occupied spaces, there was a tendency to use artillery for direct-sight firing, a method that calls for much less ammunition than indirect area fire. Since motorization was insignificant, there was little demand for petroleum, oil, and lubricants. Most supplies could be obtained locally, a traditional practice for armies everywhere.¹³ The supplies that were needed could be brought by rail. Here the Soviets held a critical asymmetrical advantage over their opponents. In a land with no meaningful highway and river/canal communications, they sat in Moscow at the hub of the sparse Russian rail net.

At the core of the Soviet experience, however, was centralized command, anathema to the normal theory of maneuver warfare: centralized command. This type of control was due in part to the all-embracing Communist command system. There was also military logic. By holding Moscow during their civil war, the Soviets held the advantage of interior lines. A central staff could mete out forces and run them down the rail lines as conditions warranted. In addition, in a war where competence was low on all sides, there was merit in pulling the best officers back to the central staff for planning. The various fronts would then execute these plans. In major operations, fronts would be reinforced with centrally held reserves and their actions supervised and coordinated by central staff representatives sent out for the purpose. This model was followed repeatedly in World War II. For example, at Stalingrad, field marshals Georgi Zhukov and Alexander Vasilevsky were responsible for planning the operation in Moscow, but they also locally supervised its unfolding when sent out as representatives of *Stavka* (staff) of the Supreme High Command.

At their base, the German and Soviet versions of deep operations had a common denominator: the ultimate objective of encircling and destroying large enemy groupings made

increasingly less coherent in their actions. Differences are in scale and in tactical implementation. The Soviets stress mass; the Germans, tactical finesse. Though both were tempered by their own experiences, Western military history is the source on which they both draw. The Soviets studied the same Great Captains whose campaigns are taught in the military history courses at the *Kriegsakademie*, West Point, and the Air Force Academy. They paid particular attention to the Napoleonic wars because Napoléon rightly has been called the inventor of strategy.¹⁴ The divergence was due in part to choosing between two great thinkers on military strategy: Henri de Jomini and Carl von Clausewitz. Of the two, Jomini is the more formal. He developed principles of war, or strategy, which in some variant or another most countries follow. The Germans are the notable exception. They follow Clausewitz's distillation. His logic is encapsulated in a number of concepts like *Schwerpunkt*, which has a rough equivalence to the favorite Soviet principle of mass or concentration. Which interpretation is better is perhaps a matter of preference.

The Soviets chose Jomini. This may have been because Jomini, having left Napoléon's service in 1813, spent the remainder of his long career as a general officer in Russia, where he founded the St. Petersburg Staff College. Most important, however, while the Soviets do value Clausewitz for his Hegelian logic and his establishment of the tie between war and politics, they also subscribe to objective, scientific laws whose validity was vigorously denied by Clausewitz. Instead, Clausewitz stresses friction, uncertainty, and chance, seeing the outcome of combat as partly random. Worse still—from a Soviet point of view—was the emphasis that Clausewitz put on the importance of individual talent and genius. This was considered bourgeois and therefore anathema to a classless society where objective laws, not subjective views, pertain.

In the Soviet view, the principles of the military art, while historical, are nevertheless scientifically derived and still

valid. The Soviets laid greater stress on these principles than did other military establishments, and their methods and organizational practice can be understood through them. There have been seven such principles, and the requirements of nuclear warfare have added an eighth (table 4). Still, these principles are not much different from those distilled by Jomini nearly two centuries ago. But, as the Soviets assert, their meaning does evolve in content and form as changes in the underlying *conditions* and *character of combat* occur. It is the latter that forms the mind-set for interpreting these principles; therefore, armies with totally different styles of war pay homage to identical principles.

The *first principle* behind Soviet-style maneuver warfare was mobility and high tempo of combat operations upon which the whole notion of maneuver and deep operations

Table 4

The Soviet Principles of Warfare at the Operational and Tactical Levels*

1. Speed: The achievement of mobility and the maintenance of a high tempo of combat operations.
2. The concentration of the main effort and the creation thereby of superiority in men and equipment over the enemy at the decisive place and time.
3. Surprise.
4. Aggressiveness in battle—no letup in the attack, breakthrough, and pursuit.
5. The preservation of combat effectiveness among one's own troops by (a) being properly prepared and efficiently organized, (b) maintaining at all times efficient command and control over one's forces, and (c) maintaining morale and the will to fight amongst the troops.
6. Realistic planning: Ensuring that the aim and plan of any operation conform to the realities of the situation, attempting neither too much nor too little.
7. Ensuring cooperation of all arms of the service and ensuring the coordination of effect towards achieving the main objectives.
8. Depth: Attempting simultaneous action upon the enemy to the entire depth of his deployment and upon objectives deep in his rear, including action to weaken his morale.

*Soviet principles of warfare at all levels stress the primacy of the offensive as a means of waging war.

Source: C. N. Donnelly, "The Development of Soviet Military Doctrine," *International Defense Review*, December 1981, 1595.

rests. The Soviets stressed maintaining high tempos, by which they meant rates of advance (kilometers per day) into the defender's depth. The more rapid the movement and the more decisive the results, the fewer their own losses and the lighter the logistical burden (table 1). Rapid movement was required by all arms and services. In World War II, this could not always be accomplished because much of the artillery was towed and also because much of the forces still depended on horse transport. Consequently, air power, and the Ilyushin Il-2 *Shturmovik* in particular, necessarily played a critical role in providing firepower support for lead units lacking accompanying artillery.

Once the defender's front was pierced or flanked, the operational object of Soviet deep operations was to preempt coherent reactions by the defender. Defending frontal units were to be isolated and cut off from the command strings coordinating their actions and the umbilical cords sustaining them.¹⁵ Successive defense lines had to be penetrated before they could be occupied in strength. Similarly, key junctures had to be seized to facilitate subsequent movement. Often these tasks were entrusted to forward detachments operating many tens of kilometers forward of already-advanced main thrusts. These detachments acted in the German flowing-water manner by

taking advantage of intervals and gaps in the enemy's combat formation; not becoming involved in lengthy battles; and widely employing maneuver for the purpose of enveloping enemy strong points, thus supporting the successful advance of the remaining forces. . . . In the past war, forward detachments were created primarily to capture the most important operational-tactical objectives or positions in the depth of the enemy's defense and to hold them until the approach of the main body.¹⁶

These movement-facilitating units had little artillery support. They had a priority call on air support, but such support was difficult because of range limitations of period aircraft and the vulnerability of Il-2s within the depths of the German front, where even local air superiority was tenuous.

The danger to the thrust-line forces was the defending operational reserves. Before nuclear weapons, these were the only enemy forces that could destroy the mobile units and block accomplishment of the deep operation. A static defense could block but not destroy the mobile units since these could back off or maneuver around the block. The best method of countering opposing mobile reserves was to disjoint or dislocate them. This prevented coordinated counterattacks and created the opportunity for defeating them piecemeal. Once the operational reserves had been eliminated—and after the Battle of Kursk in July 1943, the Germans were always pressed in scraping them together—then little could stop the Soviet thrusts until they literally outran the ability of their supply columns to maintain the pace.

Thus, operationally speaking, disruption translated into compartmentalizing enemy reserves to prevent their mutual support. This resulted in Soviet air power sometimes being used in bridge attacks (normally planned missions) and, much more commonly, large-scale “free hunt” search-and-destroy missions against moving tank columns as well as their supporting artillery, infantry, and antitank units. Therefore, disruption was the priority within the priority mission for Soviet tactical aviation.

Countering operational reserves is the “meeting engagement,” which for decades formed the single most discussed tactic by far in the Soviet literature. It was the preferred tactic in spatial battles or when forces must disperse because of the threat of nuclear weapons. These engagements are analogous to two columns of radarless destroyers coming together on a misty morning. The side that maneuvers faster to pin the other’s front and hit his flank likely wins. Since these tend to be battalion and regimental engagements, the Soviets believe fast response and practiced performance is best achieved by the use of standardized drills that can be carried out automatically, so to speak, without requiring prolonged thought on the part of the commander or innovation on that of the troops.

The scientific justification for drill is admittedly questionable. The historical example most frequently quoted in this context is that of Frederick the Great. His method consisted of employing his units in a machine-like manner, pointing them towards a prescribed objective and relying on excellent training and ferocious discipline to achieve speed and precision in movement as well as great firepower (volley firing) even at the expense of accuracy. Soviet commanders tend to gloss over the fact that this method succeeded only during the Seven Years' War (1756–63) and was later rendered out of date by both Napoléon and his imitators in other countries.

While the scientific basis of the Soviet orientation towards drills might have been questionable, the logic behind it was both consistent and practical. In a military that expected high personnel turnover owing to a combination of short-term conscript service and heavy casualties, it was necessary. In a flat, featureless countryside that allowed little room for tactical cleverness, it was also practical. Above all, however, both during the Great Patriotic War and thereafter the Soviets believed in speed and mass. Speed meant overwhelming the opponent with numbers rather than with the kind of tactical finesse sought by the Germans. Moving numbers rapidly meant that everyone had to act together while following familiar drills. It did not require original thinking by subordinate leaders, and indeed such thought was often regarded as harmful since it contributed little but delay as leaders went through the time-consuming planning and troop-leading processes.

The *second principle* governing Soviet-style maneuver warfare is usually known as mass and, more elaborately, as the principle of unequal distribution of forces along the front line with the aim of concentrating forces for the main blow on the decisive sector.¹⁷ Generally, the intent was to attack a weak place in the enemy's defense and move rapidly to the rear areas and flanks of his main shock grouping and to

terrain where combat forces, primarily task teams, could exploit success.¹⁸

In the Great Patriotic War, mass was the chief principle upon which the Soviets operated to make their heavy-handed breakthroughs and, by overwhelming rearward forces, to gain tempo and momentum thereafter. Up to 60–80 percent of the artillery and 90–100 percent of tanks and aviation available to a given front were concentrated on breakthrough sectors comprising 3–15 percent of the front. Such concentrations on the axis of the main attack gave the Soviets a superiority over the enemy of three to six times in infantry, three to 10 times in artillery, four to 10 times in tanks, and two to 10 times in aviation.¹⁹ Success in breakthroughs, the tempo thereafter, and even the casualties and required logistics have been positively correlated with concentration.²⁰ Nevertheless, the Soviets now consider mass obsolete. In its place they have put an analogous notion of focal effort:

An essential feature of the deliberate attack is the concentration of troops and weapons on relatively small frontages to achieve superiority at the point of attack. Note, however, that concentration of this type *is a carry-over from World War II tactics* [emphasis added] and, in the present view, a deliberate attack would only be used when a success of a hasty attack cannot be foreseen.²¹

It will be recalled that on the Western Front in World War I, overt infantry attacks, however strongly supported by artillery, normally failed. But such attacks, supported by only a few tanks operating with the infantry, did succeed when the Soviets mounted them in World War II. The Soviets themselves are proud of their success. They are quick to attribute it to their own clever ability to mass overwhelming numbers and to utilize to good advantage the remaining principles of war such as surprise and combined arms.

There were, to be sure, other reasons for the Soviet successes. First was the Germans' overall weakness, which placed them in a dilemma since they could not match Soviet concentrations and any attempt to do so would merely have

created weak spots on their flanks (as at Stalingrad) and made it easy for the Soviets to fight a *Kesselschlacht*, or battle of encirclement. Second, Soviet concentrations of artillery and, in particular, the intensity of their use greatly exceeded that of in World War I. Third, by late 1944 the Soviets had developed their own offensive method by attacking with only one infantry battalion on the lead in each divisional sector, thus leaving them enough room (generally about 1.5 kilometers) to maneuver in and enabling all artillery support to be concentrated at a single spot, which simultaneously saved ammunition and lightened the logistic burden.²² Fourth, and most pertinent in the present context, air power added a new dimension to the battlefield. It became possible to combine the ground offensive with simultaneous attacks along the breakthrough axis to tactical-operational depths.

Given an equally strong opponent with adequate intelligence, concentrations of the type the Soviets achieved and prided themselves upon would not have been viable. On the Western Front in World War I, such tactics led to the attacking infantry being blown away by defending artillery. In World War II, the same tactics led to the envelopment of the attacking wedge by the defense's operational reserves. This could be done by allowing the attacker to wedge into the defense in the defensive-offensive mode as the Soviets attempted at Kursk or by a preemptive, double-enveloping counterstroke as at Stalingrad. In the early postwar period, when the nuclear threshold was low, the use or threat of nuclear weapons made this style of attack infeasible.

As World War II progressed, significant changes were made in the use of artillery in the breakthrough. Most obvious was the ever-larger concentration of supporting tubes (table 5). Even more important was the change in artillery preparation, which was shortened from many days in World War I to several hours and finally to only 25–30 minutes by the end of World War II. Rocket artillery was added, increasing salvo weight by an order of magnitude for

Table 5

Average Densities of Manpower and Weapons in Breakthrough Sectors during the Great Patriotic War

Manpower and Weapons	Average Density on 1 km of Breakthrough Sector		
	1st Period June 1941– December 1942	2d Period January 1943– June 1944	3d Period June 1944– May 1945
infantry km to one rifle division	4–5	2.5–3	1.2–2.5
guns and mortars	20–80	120–220	200–300
tanks and self-propelled guns	3–12	18–40	70–85
(tanks and self-propelled guns in close support of infantry)	(3–6)	(10–20)	(12–30)

Source: Royal Military Academy, *The Sustainability of the Soviet Army in Battle* (Sandhurst, England: Soviet Studies Research Centre, September 1986), 441, and annexes.

short periods and consuming up to 45 percent of the total ammunition tonnage for breakthroughs.²³ Rather than relying on prolonged fire to weaken the defender, the Soviets had opted for short, intense blows. This stunned entrenched defenders, and it minimized both their ability to disengage or reinforce before the onslaught and the ability of higher commands to maneuver tactical or operational reserves. As A. A. Sidorenko writes,

With the neutralization of the enemy in a short time and with a high density of fire, tactical surprise was assured, large material losses were inflicted on the enemy at once, a strong morale effect was attained, troop control was disrupted, and the defender was in no condition to restore the combat effectiveness of his troops quickly and adopt any effective measures to counteract the blow.²⁴

The *third principle* is surprise. It is a supportive principle; therefore, unlike tempo and mass, it has little derivative effect upon Soviet operational doctrine and organizational practice. Surprise fits into the overall scheme by enhancing tempo and reducing numbers for an equivalent effect. It is

thus a force multiplier. In stressing centralized control of air operations and sheer numbers, Col I. V. Timokhovich states,

With mass came maneuver as Soviet aviation was committed to the support of ground troops, facilitating flexibility and promoting successful surprise. Deception combined with rapid re-grouping led to further success, assisted in turn by extensive use of decoy airfields, strict radio disciplines and constant improvements in technology.²⁵

In the nuclear era, the downgrading of mass has caused a corresponding increase in the importance of surprise. Mobility and activeness are one of the bases for surprise and are considered to multiply its effectiveness many times.²⁶

The Soviet definition of military surprise is a maneuver definition:

Tactical surprise comes from undertaking an action when and where least expected. It is not considered essential that the enemy be taken wholly unaware—only that he become aware too late to react effectively.²⁷

The Soviets combine surprise with the analogous principle of security, seeing them as two sides of the same coin. Secrecy in one's own actions facilitates gaining surprise. First the Russians, and then the Bolsheviks, had a well-known, historically rooted obsession with secrecy. A spin-off from this obsession was the concept of *maskirovka*, a term that covers the ideas of hiding, concealment, camouflage, and active deception. It includes all means of covering one's tracks and improving secrecy. In a land of steppes with few natural means of cover, the importance of *maskirovka* as a major means of achieving surprise in battle and war cannot be overemphasized. The Soviets are widely acknowledged masters of *maskirovka* at every level, from unit tactics to grand strategy of the state.²⁸ In the days before the breakup of the Soviet Union, it was often argued that such secrecy was an inherent Soviet advantage relative to Western societies and market economies that cannot function in that environment.

Unexpectedness in all its forms—new weapons, new uses of existing weapons, new tactics and most particularly numbers, and *maskirovka*—were the principal ways the Soviets sought surprise, while mobility and activeness multiplied its effects.²⁹ Unexpectedness implies avoidance of stereotyping. The Soviets claim to have achieved this, but the evidence suggests otherwise.³⁰

As far as the Soviet air force was concerned, one very important way to implement *maskirovka* consisted of choosing the right moment for introducing new weapons. To delay the deployment of advanced aircraft always implies a certain callousness. It means that active units have to make do as best they can with existing types even though they may already be obsolescent; on the other hand, it does allow one's reserve units time for training and familiarization. The Soviet method was to hold their best equipment back until large numbers had become available and then use them for the first time in focal point operations—meaning either a stroke or a counterstroke—so as to gain decisive results.

The Soviets also prided themselves on their ability to mask the withdrawal of ground and air units from secondary sectors so as to surprise the Germans with overwhelming force ratios on the chosen axes of advance that were deployed into narrow frontages at the last moment. This, in fact, may have worked at Stalingrad, where the Soviet offensive—the first of its kind—came as a total surprise to their opponents. Later in the war, however, the Germans generally knew both that the Soviet concentrations were taking place and what their general orientation was, though the precise time and place of attack remained obscure. The most obvious move that telegraphed Soviet intentions was often the Red Air Force's denuding of secondary sectors, establishing crude airfields in close proximity to the chosen axis, and flying in special fighter corps to cover the assembly of the ground formations. Generally, two days before the offensive, German defenses would be hit by intense artillery and by large numbers of ground-attack aircraft covered by

equally large numbers of fighters.³¹ Soviet claims to the contrary, it seems that they were about as deceptive as the Germans were at Kursk, which is to say not deceptive at all. The German problem was lack of options brought about by the growing disparity in forces and the inability to move large forces quickly enough.

The *fourth principle* is combat activeness, or, to use American military jargon, having the offensive spirit and gaining the initiative. But whereas linearly deployed armies tend to pay lip service to this principle and are actually passive in the defense and partly so in the delay, maneuver armies like those of Germany, the Soviet Union, and Israel base all actions upon the counterattack. Indeed, defense and delay are merely means to set up counterattacks.

Activeness in the defense is implemented by screening and strong-pointing the front and placing the resultant savings into operational reserves. In both the defense and offense, “activeness” creates the conditions for a “conformity of the organization of the rear with the character of armed conflict and methods of conducting combat operations.” The key consists of skimming away logistical assets from secondary sectors and assigning them to logistical focal efforts in order to support the decisive thrusts at the right time and place.³² Tactical aviation is similarly deployed. Aviation is cycled to peak its sorties during decisive moments—counterattacks in the defense and major thrusts in the offense—and to recharge its strength in other periods. Efficiency in air allocation and military effectiveness of air allocation thus do not correlate in the Soviet use of aviation.

The *fifth principle*, the concept of preservation of combat effectiveness, had a significant impact on the organization of Soviet formations and helps explain their relatively small divisional slice. Soviet divisions were designed to attack and fight until their resources were depleted. They minimized organizational maintenance assets and had a very limited ability to recover or repair damaged armored fighting vehicles. Higher-level formations collected and repaired

damaged vehicles that were then used to reconstitute depleted divisions. During World War II, worn-down divisions were often designated as a composite brigade and subsequently used as a reserve formation during the offensive.

Soviet air force regiments were treated similarly to ground force formations. They depended on higher-level maintenance and logistics support and were deployed and reconstituted as necessary.

The *sixth principle* is realistic planning. Soviet planning during and since World War II was, in their view, based upon realistically calculated norms and drills on training ranges that fully and effectively reflected the impact of the "fog of war." Therefore, in defining required levels of fire, force levels, logistic supply requirements and rates of advance, Soviet plans were generally empirically based.

Soviet plans fully reflected and acknowledged the tactical quality of the opponent. However, Soviet planning proved inadequate when Soviet forces were faced with conditions for which they had no prior bases for developing an approach. An example is their relatively poor performance during the campaign in the Carpathian Mountains. Their drills, norms, and plans proved totally unrealistic for preparing Soviet troops for warfare in mountainous terrain.

The *seventh principle* is coordination. This bears some similarity to the American principle of unity of command; however, the Soviet meaning also includes the concept of the interworking of the various arms. The latter gives a dynamic meaning to the more static term *combined arms*.

The importance that the Soviets put on combined-arms combat cannot be overemphasized, even if their definition of the term is opaque and often sounds vacuous. Linearly oriented armies often try to maximize firepower by striving towards homogeneous armaments and effecting logistic savings by cutting overhead. By contrast, the Soviets have never tired of repeating that combat power is generated by the interaction of different arms in such a way that each

brings out the attributes of the rest but masks its own shortcomings. Thus, diversity—which linearly oriented forces consider a logistic and operational weakness—actually becomes a strength to be exploited. This applies even to arms such as motorcycle reconnaissance, whose contribution to firepower is little or nil. Aviation enters the Soviet scheme primarily because the operations of ground forces will cause the enemy to move and expose himself to air. Conversely, the task of air is to disrupt his tempo and even bring his movements to a halt, thus enabling friendly ground forces to pin, envelop, and destroy him.

During World War II, the Soviets considered tactical aviation as an arm, comparable to artillery. Its task was to deliver firepower and at the same time provide air cover by preventing enemy delivery of firepower. Its importance was actually less than that of its sister on the ground. Whereas artillery in the last years of the war accounted for 60 percent of hostile casualties on the Eastern Front, air power only produced up to 6.5 percent of casualties in some battles and somewhat more in tank losses.³³ From this perspective, aviation was a minor arm. It could not compete with artillery for that which artillery does best. Artillery also gained some leverage by the way the Soviets deployed it—with great concentration and fire intensity along decisive axes.

Deploying tactical aviation, the Soviets aimed at even greater leverage. Secondary sectors were bled of all but perfunctory support so that aviation could be conserved for decisive events. Air armies of secondary fronts were reduced to single composite divisions. Much was brought back into *Stavka* reserve or reallocated directly to the air armies of fronts designated for the next main thrust. From 30 to 50 percent of the overall number of aircraft sorties (tactical aviation and bombers) were expended on launching strikes against enemy troops in the tactical and near operational depth.³⁴ Some were used to reinforce artillery fires in order to break forward units by adding to the intensity of the overall fire (note: this is not American-style close air

support). Most were used to attack targets difficult for artillery, such as opposing artillery and command posts, and to isolate the sector under attack; it was less a question of destroying them individually than of breaking the ties that held them together. Up through 1943, the targets considered suitable for Soviet aviation tended to be within 10 kilometers of the front lines because of the fear of German fighters. By limiting their operations in this way, Soviet aircraft could quickly run for home. Experienced pilots could be recovered if shot down, and German fighters might be lured into anti-aircraft traps. After 1943, strikes at greater depth and attacks on various rear installations became more common, though the focus always remained on facilitating operational tempo.

The unique roles for aviation, as opposed to the artillery, were to support the thrusts of mobile groups and their attempts to bring about encirclements in the defender's operational depth. While mobile thrusts, once they have broken through, may need little artillery support overall, they do need considerable fire support at critical junctures. This is a role that artillery had difficulty fulfilling, especially since tracked guns were scarce and resupply volume along primitive roads was unpredictable. Tactical aviation, with its great mobility and its own "eyes" filled this role. Without this assistance (including also the maintenance of air superiority), the Soviet mobile groups would have gone nowhere. They would have been destroyed by the Luftwaffe and by counterattacking Wehrmacht panzers.³⁵

Once the enemy had been encircled, aviation played several critical roles. A. A. Sidorenko writes,

It launched powerful strikes against the encircled force and, in some operations, played the leading role in their destruction; frustrated enemy attempts to supply the encircled force by air or to break out of the encirclement; held up the approach of enemy reserves from the rear; and covered friendly troops, conducted aerial reconnaissance, and accomplished other missions.³⁶

Had aviation not performed the above, it is conceivable that the Germans might have eased out of their Stalingrad disaster, which many consider to be the turning point of the war in the East. Instead, they lost heavily in men and equipment, to say nothing of the attrition inflicted on Luftwaffe pilots as they desperately tried to fly supplies into the pocket. From this point on, the Germans were no longer able to launch full-scale offensives; they were left always scraping for reserves.

Since they used tactical aviation in this (operational) manner, the Soviets naturally did not have much left for other missions such as supply interdiction, reconnaissance, normal air cover for secondary sectors comprising 90 percent of the frontage, and so on.³⁷ On the other hand, the above analysis shows that aviation was integrated into the overall scheme of operations and was considered a full part of the combat arms to an extent that has never been equaled in the West. Air may have been subordinate to the ground arm, but it could also be claimed that this integration got the most from the air arm in implementing the Soviet operational method and in winning the war.

The *eighth principle*, depth, was not a full-fledged operable principle in World War II. Its coming of age reflects post-World War II weaponry, including most particularly nuclear weapons and their delivery vehicles. Though the Soviets did use tactical aviation to operational-tactical depths during the war, its payloads and range were inherently limited. The role of long-range aviation was minor. It was expensive and inaccurate but did have some existential value in that it raised morale and added to the demands facing the Luftwaffe for home defense.

The campaign on the Eastern Front can be grouped into three phases. During the first phase, lasting from June 1941 to the bitter defense of Stalingrad in October 1942, the Germans were generally on the offensive, whereas the Soviets lost the entire Ukraine and only narrowly succeeded in holding on to Leningrad, Moscow, and Stalingrad. This

period also incorporates the famous Russian counterattack around Moscow, during which Hitler's insistence on hedgehogging (building well-fortified defensive strongholds) around vital centers proved correct but ultimately put an end to German hopes for victory. As we shall soon see, the Soviets during most of this period violated their own principles so elaborately developed in the interwar period. It was only after the winter offensives of 1941-42 that they began reorganizing along prepurge lines.

Phase two lasted from November 1942 to October 1943. By this time, the Soviets had learned their lesson and reorganized. This enabled them to mount the highly successful counteroffensive at Stalingrad, which in turn was followed by Gen Erich von Manstein's brilliant German counterstroke, the Battle of Kursk, and the first Soviet summer offensive. All these campaigns were fought in the south-central part of the front. At the end of the period, the Germans had been thrown back to the Dnieper River, and the initiative firmly shifted from the Wehrmacht to the Red Army.³⁸ Though the period saw both sides waging *operativ* warfare, their methods in doing so were somewhat different. The Soviets stressed numbers and the operational-strategic level; the Germans, tactical excellence and the operational-tactical level. Another characteristic of the period was the loss of whatever technological superiority the Germans had enjoyed. This was especially true in the air, where the Soviets deployed new models and the Germans, forced to use their updated models in the West, could only oppose them with older models.

Phase three lasted from January 1944 to the fall of Berlin in April 1945. This was a period of ever-increasing and more concentrated Soviet blows delivered across the entire Eastern Front, while the Germans were pressed in every theater and in every dimension of war except tactical expertise and technological excellence. The former factor was offset by the growing Soviet superiority at the operational-strategic level; the latter, by the Allied bombing campaign that disrupted

the German war economy and prevented the new weapons (particularly heavy tanks) from being deployed in large numbers. To cap it all, Hitler insisted on a strategy that compounded the German weakness. Instead of pulling his infantry back and concentrating his panzers and fighter aircraft where it mattered most—along the Moscow-Warsaw-Berlin axis—he attempted to defend along the entire front from the Baltic Sea to the Black Sea, with the result that the front was weak everywhere and was repeatedly broken through.

Stalin himself was to blame for the early disasters. The Red Army purges of 1936–39 had decimated the officer corps and done away with three-quarters of its senior ranks. The remainder were terrified and demoralized. Tukhachevsky, the founding father of Soviet maneuver warfare, was among the early victims. His demise caused his ideas and his associates—those who survived—to be discredited. Nor were the Soviets helped by their experiences during the Spanish Civil War, which, as explained earlier in this volume, was in many ways a special case. Stalin's conclusion from that experience had been that strategic bombing was too inaccurate and that short-range attack aircraft were more appropriate, a decision that dictated the tactical thinking of the Red Air Force's strategists for years to come and made ground attack into the most highly developed form of Soviet aviation. In the nick of time, it was to provide the Soviet Union with the world's most formidable short-range attack aircraft, the IL-2 *Shturmovik*, an aircraft not unlike the USAF's A-10.³⁹

Meanwhile, however, the results were mainly adverse. The Spanish experience had led Stalin to disband his mobile striking forces, with aircraft as well as tanks being dispersed to the various armies. To add to the confusion, the German blitzkrieg successes in Poland, France, and the Balkans, as well as the Red Army's own poor performance in Finland, caused Stalin to reassess his position once again. Just as the Soviet forces were beginning to rethink interwar concepts, the Germans struck.

In 1941, the deployment of the Soviet forces was also faulty. Stalin placed his forces in the manner of the politician rather than in that of the military strategist, going squarely against the classicist education of the Soviet General Staff. In an effort to create a buffer space between himself and Hitler and to defend as far forward as possible from the Soviet heartland, he greedily acceded to a partition of Poland and subsequently grabbed the Baltic republics. The space thus gained was valuable in itself, but to move the Soviet army 200 kilometers forward (in the north, right up to the borders of East Prussia itself) was an error. It enabled the Germans to use their own territory—complete with its developed infrastructure—as a springboard for their eastward offensive.

Moreover, the “lessons learned” in Spain caused the Red Army to be deployed in a linear, cordon defense. Aircraft, like tanks, were grouped in relatively small units (no larger than divisions consisting of approximately 100 aircraft) and penny packeted along the front.⁴⁰ A mere 50 kilometers behind that front were the impassable Pripet Marshes; consequently, the first defeats quickly cut the defenders into nonsupporting halves and forced them into diverging withdrawal axes along rail lines radiating out from German-occupied Warsaw. In the months just prior to the German invasion, Stalin was afraid of provoking Hitler. He therefore tolerated frequent German reconnaissance intrusions into Russian air space. In addition, the Soviet garrisons were not in a high state of readiness even though intelligence reported German intentions. The end result of all these factors was to present Hitler with an opportunity he could not refuse: to encircle the Red Army before it could retreat into the trackless spaces of Mother Russia.

As 22 June dawned, the Soviet air force, as already related, was caught totally by surprise. Main airfields were hit by special air intruders who coordinated their missions with the first artillery fire. Shortly thereafter, airfields across the front were struck. Most Soviet aircraft were caught

neatly parked. They were wrecked by special fragmenting cluster munitions. Within hours some 2,000 Soviet aircraft belonging to the forward armies were destroyed, and another 1,500 were lost in the following days. Within days the base organization of the Soviet air force was lost as the panzers sliced into the front and launched large and small *Kesselschlachten*, netting nearly 2million Soviet troops before mud-making rains in October and early cold in November brought the German advance to a halt. Base personnel and equipment were among those trapped. What occurred can be summarized as follows:

Almost parallel with and at a distance of not more than 50 kilometers from the border, all fighters, ground-attack and tactical reconnaissance units were in position on airfields in almost linear disposition, without any organization in depth, without outposts, without defined areas of main effort, and with their sub-units loosely distributed. The disposition of the heavier air forces was very similar, in areas between 100 and 150 kilometers farther back. Even the services farther in the rear, the reserve and training units, and the industrial air services, showed clear signs of rigid schematism. The results of this defective plan of concentration are generally known; with the first two weeks of war they were to cost the Soviet air forces more than 50 percent of their total front-line strength and were to lead later to almost complete annihilation.⁴¹

Within this disaster, two fortuitous events stood out. Since the Soviet air force was mostly destroyed on the ground, few pilots were lost; furthermore, the main victims of the German surprise attack were old planes (I-15 biplanes for ground attack and I-16 Ratas for fighters) in the process of being replaced. Their replacements (i.e., early model Il-2 *Shturmoviks*, I-18s and 26s [MiG-3 and Yak-1], and LaGG-3s) were considerably better. Even so, lack of ancillary equipment such as radio and navigation aids meant that the newer Soviet planes remained much inferior to equivalent German aircraft.

Although the Red Air Force was no match for the Luftwaffe in terms of materiel, training, tactics, and logistical support—

and, after the attack, numbers—it doggedly fought on, scoring occasional minor successes in reconnaissance and in ground attack against German armor in the open steppes in the south. But the cost of confronting the Luftwaffe was high. The Soviets lost most of their trained pilots and many of their remaining aircraft.

The Soviet High Command, recognizing the Soviets' absolute inferiority, ordered survival tactics for their fighter and ground attack aircraft. Most fighter actions were defensive. The advancing German columns might not see a Soviet aircraft for days and then, just as they would approach some strategic bridge, watch it being attacked by an entire Soviet squadron consisting of I-15s or some other obsolete aircraft employing suicide tactics. To evade the superior German fighters, minimize aircraft losses, and enable downed pilots to be rescued, the Red Air Force generally limited its attacks to within 10 kilometers of friendly lines,⁴² a method that had the further advantage of helping draw the enemy into antiaircraft fire traps. To the extent that 90 percent of Soviet aircraft downed during this period (the summer and autumn of 1941) were lost over Soviet territory, these tactics worked.⁴³ On the other hand, most German combat losses were caused by ground air defense.

Soviet aircraft caught by German fighters generally attempted to escape by flying down “into the weeds.” Alternatively, they would form a tight horizontal defensive circle that would whirl like a cyclone back to their own lines. The tactic reflected both a weakness of Russian aircraft—their obsolete engine would not give them climbing power for more diverse tactics—and their excellent maneuverability. The Germans often found it difficult to break up the circle; if they succeeded, however, confusion reigned and most Soviet pilots foundered.⁴⁴

If there was a success story in 1941, it was the baptism in August of the renowned Il-2. This excellent aircraft was used in ground attack, which was the most logically developed

and employed arm of the Soviet air forces. Even so, early Il-2s were vulnerable since they had no rear gunner. The cover provided them by protecting fighters was almost uniformly poor, whereas the then-prevailing organization made concentrated blows difficult or impossible to deliver.

By late 1941, the Luftwaffe had virtually eliminated the Soviet air forces from the skies. What saved them, or at least provided a breathing space and a respite from continued hemorrhaging losses, was the arrival of winter in November. During the respite from November 1941 until the next German offensive began in May 1942, the Russians began receiving the new production from the relocated factories behind the Urals and rehabilitating and retraining their fighter and ground-attack units. By spring, when they were aided by the fact that some of the German forces had been moved to the Mediterranean, they once again had numerical superiority. While still inferior to the Luftwaffe overall, and even more so unit to unit, they had corrected their greatest deficiencies in flying ability, operational procedures, and command, control, communication, and intelligence (C³I).

In particular, centralization of aviation was reimposed in April 1942. Taking a leaf from their German opponents,⁴⁵ the Soviets started pulling air units away from the ground armies/corps to which they had been organically assigned and which had hindered their concentration at focal efforts. Air corps and air armies were created, and these were allocated to fronts and *Stavka* reserve. By the time of the Battle of Stalingrad, the latter had grown from a handful of air groups to a third of Soviet aviation; by 1945, it comprised 43 percent of all aviation. In theory, all air corps belonged to *Stavka* reserve and were allocated in accordance with the *Stavka's* strategic planning. Although tactical control was exercised by the air army to which they were attached, these air corps were to be used for major air operations only and withdrawn for regrouping and reequipping once these operations were completed.⁴⁶

Under the new system, each front was assigned an air army with a variable number of air divisions. An air army provided a flexible framework under operational command of front commanders but subordinate in all other matters to the Air Force Central Administration in Moscow. This arrangement forged a close working relationship with the army, but at the same time allowed air units to conduct their own operations with relative independence under their own chain of command.⁴⁷ For ground-attack units, cooperation and information exchange with the army generally worked quite well. This was the case when air units were subordinate to the ground for specific missions (e.g., exploiting tank armies) and also when they coordinated their missions, the latter being the more customary.⁴⁸

Henceforward, fronts positioned in secondary sectors might be assigned only a single composite air division. Meanwhile, fronts designated for main offensives would be variably reinforced with several air corps composed of three or four air divisions each, plus additional air divisions and miscellany. By 1945, air armies occasionally held as many as 30 air divisions.

Logistically speaking, responsibility for supporting assigned air divisions fell to the air armies. The air corps was a purely tactical headquarters. Early in the war, air divisions operated permanently assigned mobile base groups for their flying regiments. After the reorganization, base construction, operation, and backup maintenance were air army responsibilities. Even when the flying divisions were elsewhere, preparations were made for their subsequent return. In this way, divisions and regiments could be mobile and rapidly shifted about the front as required.

The manning levels of Soviet 30-plane regiments were very low. Regiments, responsible for crew and limited maintenance support, had strengths of 34 pilots, 130 technicians, and 15 other personnel for a total of 179 for 30 aircraft.⁴⁹ Regiments were dependent on separate air base associated units for organizational-level maintenance and

consumable support. This organization greatly facilitated the flexibility of Soviet air power. Given their relatively short range, most tactical Soviet aircraft had to be relocated laterally and then forward to be able to support concentrated ground offensives. Had squadrons been large units with extensive ground support equipment, rapid relocation of air power would have been impossible.

In this mode of operations, consumables (fuel and ordnance) were predeployed long before the onset of an offensive. The size of the forces deployed on airfields, which in World War II were any reasonably flat, smooth surfaces (most often compacted farm fields), could rapidly swell. The personnel required at each base for organizational-level maintenance and consumables was relatively limited, given the Soviet tendency to repair by replacement and the limited ordnance-delivery capability and fuel consumption of each aircraft.⁵⁰

During most of 1942, the Soviet air force remained defensively oriented so as to conserve its strength and, in the fall, to build reserves for the planned Stalingrad counter-offensive. Its increased effectiveness was largely due to a corresponding attrition in German strength. The further east the Germans advanced and the larger the extent of territory that they occupied, the more overextended the Luftwaffe became. Consequently, it was forced to adopt measures and dispositions that reduced its effectiveness, such as providing stronger escorts for attacking Stukas and bombers.⁵¹

During the respite offered by the winter of 1942–43, fighter aviation—distinct from ground-attack aviation—was made into an elite arm in order to create the attributes necessary for success in air combat. Increasingly, the Soviets adopted German and Western practices for air-to-air tactics in lieu of more primitive indigenous practices. The basic formation now became the German two-ship flight in a four-ship *Gruppe*, and the “wing man” idea for mutual fighter protection and better attack coordination was adopted.⁵² To instill esprit, Guard units were formed, and these drew on the best pilots and most modern aircraft.

The missions assigned to fighter units were mostly indirect. They consisted of creating pronounced concentrations over the immediate front and the close rear so as to protect the assembly of ground and air forces prior to an offensive, to seal off the battle area during major engagements, and to provide cover for other types of aircraft and the armored forces spearheading the attack. These units were committed at the points of the main effort of the ground battle, while lesser fighter units were employed along less active sectors. In 1942 and 1943, most campaigning took place in southern Russia. The central and northern fronts were relatively quiet until 1944.⁵³

Starting with the Stalingrad counteroffensive in November 1942, Soviet air operations were virtually coextensive with events on the ground, as would be expected from the style of these operations. Like artillery and tanks, and mirroring logistic support, air power was increasingly concentrated (table 6) at points of main effort. Infantry, artillery, and air power were the instruments whereby breakthroughs were made; and tanks and air power formed the instruments of exploitation. Soviet air forces were required to adapt their operations to the requirements of these circumstances. Their mounting strength enabled them to do so, but it nevertheless implied that air warfare almost exclusively restricted itself to those areas in which ground operations were in progress, while air activities came to a complete standstill elsewhere.⁵⁴

In 1943, the Soviets gained equality in the air. But it was not until the following year, by which time parity had turned into superiority, that their units as a whole began to show the aggressiveness corresponding to their newfound power. Guard fighter units—composed of the best and most experienced pilots—displayed these characteristics from their formation in December 1941. Other units required more time because of the high losses and because the Guard units were drained of pilots displaying the sought-after characteristics of versatility, aggressiveness, and self-discipline.

Accordingly, to the very end of the war, Soviet fighters as a rule remained cautious in the presence of German aircraft and air defense artillery in spite of very great improvements in terms of numbers, training, standards, morale, experience, and better aircraft and tactics.⁵⁵

Even in 1945, when the Soviet superiority had become much greater, the contrast between air superiority in the East and West was sharp. Western air forces were able to dominate the sky to such an extent that supply routes were practically impassable for German columns during daylight. On the Eastern Front, German supply traffic in the rear areas proceeded almost undisturbed. German fighters operating in the West generally found themselves engaged in combat almost as soon as they left the ground and consequently were

Table 6

**Average Aviation Densities on Axes
of Attack in the Fronts**

Operation and Fronts	Aircraft Density per Kilometer of Breakthrough Sector
Belorussia	
First Belorussian Front:	
Rogachev Axis	96
Parichi Axis	53
Second Belorussian Front	45
Third Belorussian Front:	
Borgushevsk Axis	43
Orsha-Minsk Axis	93
Lvov-Sandomierz	
First Ukrainian Front (Rava- Russkaya and Lvov axes)	129
Yassy-Kishinev	
Second Ukrainian Front	57
Third Ukrainian Front	58
Visla [Vistula]-Oder	
First Belorussian Front	57
First Ukrainian Front	73
Berlin	
First Belorussian Front	126

Source: Vasilii Y. Savkin, *The Basic Principles of Operational Art and Tactics: (A Soviet View)*, translated and published under the auspices of the US Air Force (Washington, D.C.: Government Printing Office, 1974), 222.

unable to execute their assigned missions. In the East, they generally still found it possible to execute their missions, although within limited areas and subject to limitations in time. Air units of the Western Allies were in evidence at all times of the day, in all combat areas and over Germany. The Soviets endeavored only to achieve and maintain air superiority at and near the front and to destroy the German frontline army units.⁵⁶

Throughout the war, the workhorse of Soviet aviation remained the ground-attack arm. It was not elite. It was considered expendable, and condemned personnel were often assigned to its units. Still, the pilots won the respect of their German opponents for their sheer courage. Fortuitously, the Red Air Force possessed the armored Il-2, which did much to contain otherwise heavy losses. From late 1943, it became common for *Shturmoviks* to operate in regimental or even divisional strength in subgroups of six to a dozen aircraft, while pairs undertook "free-hunt" sorties, attacking targets of opportunity at treetop level and using contours of the landscape for surprise and escape.⁵⁷ Like their German opponents, the Soviets were able to fly as many as eight to 10 sorties per aircraft per day during the most intense periods. To achieve this, fighters and attack aviation units operated from so-called springboard airstrips located as close as 10 kilometers from the original line of contact.⁵⁸

Apart from the early desperate days (when Soviet air units often attacked their own bridges in an effort to stem the German advance), the first priority of Soviet aviation during most of the war was given to operations in the main battle areas. The targets of choice consisted of tanks, assault guns, heavy infantry weapons, and field fortifications. It was only as secondary considerations that attacks were directed against targets in the rear areas such as rail traffic and installations, vehicle and troop columns on the march, Luftwaffe installations, and so on.⁵⁹ To the extent that the latter type of targets became more salient from mid-1944 on, fighters tended to attack them in the role of fighter-bombers

in “free hunt” operations rather than in systematic interdiction campaigns. Attacks on the German rear never achieved the significance of the attacks in the battle area. Still, there were occasions where they produced very noticeable results, as for example at the time of the collapse of German Army Group Center (June 1944), when ground-attack forces attacked traffic bottlenecks on the bridges over the Berezina River.⁶⁰ Their greatest contribution was that of providing cover and support for their advancing mobile groups. However, they were often inattentive or their efforts poor in interfering with German withdrawal movements after the breakthrough was completed and the pursuit had begun.⁶¹

Whereas Soviet ground-attack and fighter arms steadily improved from the winter of 1941 up through 1944, rehabilitation of bomber and reconnaissance arms lagged. Heavy bombers had been a favorite of the Soviet air force up through the Spanish Civil War, where they had proved ineffective owing to poor aiming techniques.⁶² Moreover, these arms were less central to the ground orientation of the Soviet High Command. Bombers with multiple engines were expensive to build, whereas reconnaissance required a high degree of technical expertise. It was only after the Soviets had achieved overwhelming superiority in numbers, technological equality, and a measure of experience in the fighter and ground-attack arms that they began to redress the imbalances in the remaining aspects of air power. Even then, the emphasis on ground operations/combined arms continued to make itself felt. To the very end of the war, the major role of Soviet bombers was that of continuous, concentrated attacks in the near German rear at points of main effort. Indeed, beginning with the June 1944 offensive, the long-range bomber arm was redeployed from reserve in the Moscow region, brought forward, and employed in concentration in those areas in which the Soviet High Command launched its major attacks.⁶³ About this time, all Soviet aviation edged deeper in its attacks as it gained air superiority, confidence, and surfeit capability.

In the years since 1945, the Soviet air force's role in World War II has been much criticized in the West for having been little more than an appendage of Soviet artillery. It did not engage in strategic bombing against the enemy's homeland. It did not pursue air superiority in a comprehensive manner, and it virtually neglected supply interdiction.

To gain a realistic appreciation, however, one must look at these shortcomings against the mode of Soviet air operations. At bottom, it was the same as that of the Germans—*operativ* warfare waged by the air forces in conjunction with the army and aimed at outmaneuvering, encircling, disrupting, and destroying the enemy's armed forces. To be sure, the problems confronting the Germans and the Soviets differed in three critical respects. First, the longer the war, the more the Germans were forced by Anglo-American strategic bombing to become an air defense air force against strategic attacks, whereas the process worked just the reverse for the Soviets. Second, devastating initial losses and a continuing unit-by-unit inferiority vis-à-vis the Germans limited Soviet freedom of action until the last year of the war. Third, the Russian and Soviet style of war has always tended towards numbers and mass rather than towards tactical and technological excellence, as favored by Germany (and the West).

These factors meant that during most of the war, the Soviets could not afford to attack far beyond the edge of the forward line of own troops (FLOT). To have done so would merely have aggravated already high loss rates and prevented the accumulation of experience for more demanding use of air power. Nevertheless, though the sacrifice was huge, the Soviets did what had to be done. As early as 1942–43, their deep-penetrating mobile groups were covered and supported by swarms of fighters and ground-attack Il-2s.

The argument that focusing on *operativ* warfare led to the neglect of long-range bombing may have a certain validity when applied to the Germans. Had the Luftwaffe possessed such a capability during the early days of the war on the

Eastern Front, it might have obstructed the relocation of Soviet industry, although whether the opportunity was worth the cost is unanswerable. In the Soviet case, however, the argument has to be considered invalid. Any independent long-range air arm that the USSR could have afforded during these years would have been a pale shadow of American and British capabilities and not worth the effort. The famous *Strategic Bombing Survey* conducted after World War II suggests that the main accomplishment of American and British long-range bombing was the diversion of German resources into air defense, giving the Soviets a free ride on this account.

Given these limitations, the really interesting comparison is between the styles of the Soviet and Anglo-American *tactical* air forces. The particular irony is that while Soviet aviation was distinguished by its usage in the near battlefield area, it was an *operativ* air force. However, Anglo-American tactical aviation, though deep ranging, remained tactical to the very end. This was not a question of organization and command. The RAF and the Luftwaffe were independent services, whereas the US Army Air Corps and Soviet air armies were army components under army command. Nor is it a question of not wishing to provide support to the ground forces. Though the emphasis differed from one case to another, at bottom all sought to do so.

What is at issue is not organization but doctrine. Both the RAF and the USAAF subscribed to the Douhet theory of strategic bombing. Hence, they were both committed to fighting the air battle for its own sake. Equally, both sought air superiority and interdiction of enemy supplies and reinforcements as goals in themselves. The German and Soviet air forces did not. Both focused on supporting deep-penetrating battles and upon the other's countering reserves. Two central issues are involved: the nature of combined-arms warfare and the notion of *Schwerpunkt*. Both the German and Soviet military visualized combined arms in terms of the impact of the *diversity* of arms, including air

power. In the West, by contrast, like forces have tended to fight like forces both on the ground and in the air.

Even more important than combined arms is the question of focal effort. Are the available forces dispersed linearly and do they fight continuously? Or are most of them concentrated and fight only in a surge manner? The first of these methods leads to across-the-front, static, attrition warfare with emphasis on built-in organic support and heavy demands on artillery and logistic support. Interdiction of supplies is important; interdiction of forces is not important because large reserves are nonexistent and the defense is based on firepower, not on the maneuvering counterattack.

The characteristics associated with the second method are just the opposite. When the focus is on the tempo of operations, interdiction of supplies is not critical, and indeed there is little to interdict except during periods of focal efforts. Those who so regard this method must conclude that the Soviet air force's mode of operations was appropriate for the Soviet style of *operativ* warfare. It would not have been appropriate—nor did the Soviets have the air assets—to execute the American and British style of linear, attrition warfare with its requirement for generalized across-the-front air superiority and ground support. Conversely, while the Western air forces had the assets, they would have had to recast their mode of operations to support Soviet-style focal effort warfare.

These considerations explain why Soviet aviation, unlike Western aviation and more like the Luftwaffe, did little in the way of supply interdiction and still less in long-range bombing. Instead, Soviet aviation, including most bomber units and even the Long-Range Air Force, focused on supporting deep ground operations. First, it helped break the tactical defense; then it covered and supported the breakthrough forces as the latter destroyed encircled enemy forces before exhausting themselves 200–300 kilometers into the German operational-strategic depths. Helping these forces maintain a rapid tempo was air's principal goal.

Although counterair was important, here also the Soviet practice differed from the Western one. Air base attack normally began only in the immediate days before the offensive and did not aim at achieving complete command of the air, a condition which, given German technical and tactical superiority until late in the war, could not have been achieved on the Eastern Front. Instead, the Soviets had to content themselves with tenuous local air superiority. The normal method was to stand back and then fill the void as soon as the German fighters left. Somewhat more aggressively, some Soviet aircraft might preoccupy the German fighters while others went after what the Soviets considered the real targets—the Stukas and bombers.

Had the Soviets preceded each major offensive with a prolonged battle for air supremacy, the effect would have been simply to give the game away and cause the Germans to bring up their own forces from other and quieter sectors. The Soviets would have been drawn into an air attrition battle that they could not have won in the early years and that was not in their interest afterwards. In combined arms, the purpose of arms is not forces fighting like forces but rather that of contributing to the overall battle—in this case, the success of the deep operation and the shattering of the enemy. Soviet fighters were supposed to protect their own tanks against Ju-87 Stukas and their Il-2 *Shturmoviks* against Me-109s, not to win some vague air superiority battle.⁶⁴

Finally, attacking supply lines did not fit into this operational conception either. Interdiction would have required more aircraft than the Soviets had available until the end of the war; forced them to operate deep in the enemy's rear, where they would have been at a disadvantage vis-à-vis the Luftwaffe and where the chances of recovering downed pilots were minimal; destroyed bridges and other bottlenecks that the Soviet forces themselves might want to use; and, in the case of railways, wasted precious assets on a job that could often be done more easily and more cheaply by partisans. The Germans could and did minimize the effects

of interdiction by moving at night. Last, but not least, given the fact that the German style of war itself was based on maneuver rather than attrition, the supplies to be interdicted were often neither very extensive nor by any means easy to find.⁶⁵

To sum up, one must conclude that much of the criticism heaped upon the Soviet air force in World War II is based on a failure to appreciate the difficult circumstances facing the Soviet Union as well as the demands made by a different style of war. The irony is that the tables have been turned. From 1980 on, the United States military has officially studied the style of war practiced by the USSR in World War II. *Operativ* warfare is now part of the requirement for US forces. The air forces of the Soviet Union were among those most experienced in this style of war in World War II. Some of the practices once criticized must now be adopted, and some practices long dear to the USAF must correspondingly be dropped.

Notes

1. In World War II, Soviet divisional slices were only one-third of Western ones. Yet not only was Soviet infantry able to bring more firepower to bear but, thanks to the system of maintaining a central park, artillery also was available in greater quantities during breakthrough battles. See John A. English, *A Perspective on Infantry* (New York: Praeger, 1981), 176–77.

2. See Christopher Donnelly, "The Development of Soviet Military Doctrine," *International Defense Review*, no. 12 (1981): 1589–96.

3. Data from Christopher Donnelly, *Red Banner: The Soviet Military System in Peace and War* (London: Jane's Information Group, 1988), 223.

4. Jaeger infantry is a special high-quality light infantry operating in especially difficult conditions such as mountains and forests. It survives by stealth and fights by stalking its opponent. By the nature of the terrain, it normally fights in relatively small units. Virtually all the famous German panzer commanders in World War II had a jaeger or scout cavalry background. In many ways, German panzer operations are a scaled-up version in time and space of jaeger infantry tactics. This is best seen by comparing Erwin Rommel's tactics as a captain of mountain infantry—see his *Attacks* (Vienna, Va.: Athena Press, 1979)—with his performance as a "desert fox" in North Africa.

The jaeger background explains why maneuver warfare has been a “bottom-up” affair in Germany whereby juniors set up the play for observing seniors to exploit with their reserves. By contrast, the Soviet practice has been “top down.” Wise men from above set the operation, and subordinates choose the best implementing tactics from a menu prescribed by these wise men.

5. The foreign intervention forces did not come with the full paraphernalia of combat. In addition, they were small and tied to the rail lines; while tactically strong and strategically important, they lacked “operational” content.

6. John Erickson, *The Soviet High Command: A Military-Political History, 1918–1941* (Boulder, Colo.: Westview Press, 1984), 92.

7. Donnelly, *Red Banner*, 220.

8. Erickson, 327.

9. *Ibid.*, 282.

10. Alexander Boyd, *The Soviet Air Force since 1918* (New York: Stein and Day, 1977), 25.

11. Vasilij Y. Savkin, *The Basic Principles of Operational Arts and Tactics: (A Soviet View)*, translated and published under the auspices of the US Air Force (Washington, D.C.: Government Printing Office, 1974), 40.

12. Donnelly, *Red Banner*, 70.

13. See Martin van Creveld, *Supplying War: Logistics from Wallenstein to Patton* (London: Cambridge University Press, 1973), chapter 1.

14. See Martin van Creveld, *Command in War* (Cambridge, Mass.: Harvard University Press, 1985), chapter 2.

15. While overrunning soft artillery and logistical support is a task of penetrating armor, this is mainly a task along the thrust axes. Closing pincers will normally be well behind defending artillery.

16. A. A. Sidorenko, *The Offensive: (A Soviet View)*, translated and published under the auspices of the US Air Force (Washington, D.C.: Government Printing Office, 1973), 104.

17. This principle, first demonstrated by Epaminondas, Theban general and statesman, contains a number of subtleties. One is the principle of economy of force. Another is the notion of screening. Still another is echeloning whereby the opponent’s forces are pinned in place while one’s own are effectively held back so as to double as a reserve. Observing these subtleties was a princely hostage in Epaminondas’s entourage named Phillip, who, by adding cavalry and the interworking of arms, forged a new-style army for his son Alexander.

18. Savkin, 219.

19. *Ibid.*

20. Royal Military Academy, *The Sustainability of the Soviet Army in Battle* (Sandhurst, England: Soviet Studies Research Centre, September 1986), 93, 95, and 103.

21. John Erickson, Lynn Hansen, and William Schneider, *Soviet Ground Forces: An Operational Assessment* (Boulder, Colo.: Westview Press, 1986), 53.

The Germans came to the same conclusion in 1917. In their view, the act of concentrating telegraphed one's intentions while actual concentration was vulnerable to opposing artillery. This was combined with the observation that communications allowed high commanders to monitor developing situations and to subsequently reinforce the most promising penetrations. Thus in their scheme, high quality troops—*Stosstruppen* in World War I and panzers in World War II—replaced the need for mass and close control.

Four decades later with the advent of nuclear weapons, the Soviets have evolved to a similar concept. Nuclear weapons substitute for the need to concentrate and make concentration too risky. Concentrated penetrations have been replaced by multiple probes with reserves standing by for quick concentration through a gap and subsequent dispersal so as to capitalize upon the success of the more promising probes.

22. Sidorenko, 25–26.

23. *Ibid.*, 24.

24. *Ibid.*, 23.

25. Boyd, xviii.

26. Savkin, 240.

27. Erickson, Hanson, and Schneider, 53.

28. Donnelly, *Red Banner*, 43.

29. *Ibid.*

30. See for example, Walter Schwabedissen, *The Russian Air Force in the Eyes of the German Commanders*, USAF Historical Study no. 175 (Maxwell AFB, Ala.: USAF Historical Division, Air University, 1960); and Klaus Uebe, *Russian Reactions to German Airpower in World War II*, USAF Historical Study no. 176 (Maxwell AFB, Ala.: USAF Historical Division, Aerospace Studies Institute, 1964). The Schwabedissen account is a particularly detailed and unbiased account that tracks well with the conceptual framework outlined in this chapter.

31. Schwabedissen, 224.

32. *Ibid.*, 157.

33. Sidorenko, 20; and Erickson, Hanson, and Schneider, 13, credit air with inflicting tank losses from .5 to 17.7 percent in various campaigns. Both attribute roughly 75 percent of tank losses to artillery. This high number is explained by the fact that Soviet divisional artillery was principally guns that doubled as antitank guns.

34. *Ibid.*, 28.

35. An interesting statistic is that 11 percent of German counter-attacks were in the battle for the first position, 58 percent for the second, and 30 percent for the third position. Thus, about 89 percent of the

counterattacks had to be repelled beyond the limits of the first position, that is, where the enemy reserves were not dependably neutralized by fire during the period of artillery preparation. *Ibid.*

36. *Ibid.*, 37.

37. Ground-attack missions accounted for 38 percent of the sorties, air superiority 28 percent, naval aviation 9 percent, reconnaissance 9 percent, air defense 7 percent, deep interdiction 4 percent, partisan support 3 percent, and strategic bombing 2 percent. Oleg Hoeffding, *Soviet Interdiction Operations, 1941-1945*, Rand Report R-556PR (Santa Monica, Calif.: Rand Corporation, 1970), 5, 8.

Within the ground-attack statistic, from 78 to 91 percent of all ground-attack and bomber sorties each year were expended for close support on the battlefield. Boyd, xviii.

The reconnaissance statistic is misleading. The Soviets held the philosophy that reconnaissance was a second task of air missions. This led to poor results that were tolerable only because the Soviets had such good intelligence from their partisans. By 1944, as the Soviets were less pressed and as fighting passed from their territory, reconnaissance was upgraded and German and Western practices adopted.

38. Erich von Manstein, *Lost Victories* (London: Methuen, 1958), 367-442.

39. Some 35,000 of these highly successful aircraft in various models were produced during the war. Robert Jackson, *The Red Falcons: The Soviet Air Force in Action, 1919-1969* (Brighton, Mass.: Clifton Books, 1970), 56, 78.

40. Soviet aviation throughout the war was organized in squadrons of about 10 aircraft, three or four squadrons per regiment, and three regiments per air division. Regiments had single-type aircraft, whereas divisions might be either pure or composite.

41. Schwabedissen, 70-71.

42. Ten kilometers is not restrictive when considering the fact that the Russians were mostly concerned about protecting their own troops from the Luftwaffe and from the very beginning focused their ground attack upon the thrusting German tank pincers (often ignoring marching infantry). Ten kilometers could thus be from the deep flank as well as the front.

43. Schwabedissen, 87.

44. *Ibid.*

45. See Peter C. Smith, *Close Air Support: An Illustrated History, 1914 to the Present* (New York: Orion Books, 1990), 78.

46. Boyd, 141-43.

47. Schwabedissen, 179.

48. *Ibid.*, 224.

49. *Ibid.*, 193. This statistic is cited because the USAF is shifting to an expeditionary posture similar to that used by the US Marine Corps

(USMC) and which resembles Soviet practice. A USMC flying squadron of 12 F-18 aircraft has 271 personnel, and one with all-weather aircraft has 302 personnel. Fleet Marine Force Reference Publication (FMFRP) 1-11, *Fleet Marine Force Organization*, 1990, 5-26.

50. The Soviets today remain true to this basic operating concept. Modern Soviet aircraft continue to have low-pressure tires, articulating landing gears, protection against foreign body ingestion problems, and limits on takeoff weights. Therefore, they can operate from unprepared airfields, even gravel strips, frozen lakes, or open fields. Soviet aircraft are very reliable and require minimal organizational maintenance. Each tactical aircraft has an assigned truck with a two-man maintenance team. The truck can tow aircraft on civil roads and has built-in test gear, starter, and fuel transfer pumps. Aircraft will deploy from remote sites near a main operating base, which provides consumables and organizational maintenance support and replacement parts for them. The advantages of the system were demonstrated in the Gulf, where the Iraqi air force was similarly organized; it is estimated that about one-half of their aircraft survived Operation Desert Storm because they were moved into secure, remote locations.

51. Schwabedissen, 192.

52. Uebe, 30-31.

53. Schwabedissen, 190.

54. *Ibid.*, 266-67.

55. *Ibid.*, 270.

56. *Ibid.*

57. Boyd, 149.

58. Robert A. Kilmarx, *A History of Soviet Air Power* (New York: Praeger, 1962), 183, 190.

59. Schwabedissen, 336-37.

60. *Ibid.*, 344-45.

61. John Greenwood and Von Hardesty, "Soviet Air Forces in World War II," in *The Soviet Air Forces*, ed. Paul J. Murphy (Jefferson, N.C.: McFarland and Co., 1984), 61.

62. Kilmarx, 126-27.

63. Schwabedissen, 348-50.

64. *Red Army Field Regulations* (Moscow: RKKA, 1944), 172. Even the concept of air supremacy did not emerge until halfway through the war, and it was inextricably linked with ground force operations. It was not seen as a strategic goal in itself but as a tool at the operational level to enable the ground force to operate in an optimum environment. See R. Pennington, "Pilot Initiative in the Soviet Air Forces" in Murphy, 149.

65. In World War II, a German armored division needed only 350 tons of supplies per day to be fully operational, as against 600 to 650 tons for an American division. See van Creveld, *Supplying War*, 185, 215.

Chapter 5

Israel: Maneuver Warfare, Air Power, and Logistics

After 1945, the locus classicus of large-scale, conventional, modern warfare underwent a change. Whereas such warfare previously had seen the armed forces of the most important military powers engaged, it now tended to be waged by the armies of countries that, initially at least, were third and even fourth rate. Whereas previously it had tended to take place in Europe, it now moved to the “rimlands” along the southern borders of the Asian continent. Specifically, the Israeli Defense Forces (IDF) have crossed swords with the surrounding Arab states in 1947–48, 1956, 1967, 1973, and 1982. Today, although there are some indications that peace may finally be on its way, both Israel and its Arab enemies remain heavily armed. Even as these words are being written, they are preparing themselves for the next round of combat.

This chapter first of all presents a brief overview of Israel’s geographical and strategic position, a position that is largely responsible for the decision of its armed forces to adopt maneuver warfare as their *modus operandi* and to become perhaps *the* current leading proponents of the art. This overview is followed by a brief account of the 1967 war, including planning, the role of the Israeli Air Force, ground operations, and logistics. Next, there is a short discussion of development between 1967 and 1973 as well as an analysis of the 1973 war, first the war on the ground and then—this being our main field of interest—in the air. The chapter ends with a retrospective look as well as some lessons learned.

In this case, as in most others, the key to military thought is size and geographical position. Israel is an exceedingly small state. (Even with the occupied territories, its total area is only about 27,000 square kilometers—about the size of the state of Maryland.) Except in the west, where it

borders on the Mediterranean Sea, Israel was for the first 30 years of its existence surrounded on all sides by enemies who significantly outnumbered it in terms of population, resources, and numbers of military forces. It successfully devised a way to overcome these significant strategic disadvantages. To do this, it has turned itself into something approaching an armed camp. It is currently one of the few nation-states that has a true national doctrine for defense; hence all elements of government and civil planning, national resource allocations, and the defense organization are synergistically interactive.

Since the inception of the state, Israel's military forces have been based on the use of a professional cadre, conscripts, and reserves that can be very rapidly called up and operationally deployed in case of need. This system allows the country to put nearly 20 percent of its total Jewish/Druse population under arms within 48–72 hours of mobilization. Of those forces, some two-thirds are organized into combat formations belonging to the ground forces, the air force, and the navy, whereas the rest (including some women) are used for territorial defense, internal security, and, increasingly, civil defense against possible Arab air and missile attack directed at the civilian rear.

Unlike the United States, Israel has a single, centralized General Staff that comes directly under the Minister of Defense. Over the years, this organization has enabled the country to react effectively to the evolution of technotactics, to readjust resources between combat arms, or even to change combat arm roles and missions. During wartime, the General Staff functions as a general headquarters allocating resources to Israel's six current operational theater commands (North, Central, South, Air, Sea, and Civil Defense), setting objectives and devising plans.

Even today, Israel's gross national product (GNP) amounts to less than \$40 billion, and its total mobilizable population only numbers about four million people. Yet the Israeli Defense Forces (IDF) can field 18 large divisions,

including 13 armored and two elite multimission assault infantries equipped with about 15,000 armored fighting vehicles; an unusually high-quality, technologically advanced air force that includes about 700 fighter/attack aircraft and 250 combat helicopters; a navy with 20 capable fast-attack craft; and nuclear forces with hundreds of weapons, including thermonuclear warheads mounted on advanced intermediate range ballistic missiles (IRBM). Using any measure of effectiveness, Israel's national defense system is much more efficient than that of any North Atlantic Treaty Organization country.¹

Israel's strategic position is characterized by the fact that it is surrounded by Moslem countries it cannot occupy or unconditionally defeat. Hence, early on it developed a politico-military doctrine with which its wars would be fought as engagements. As in the case of Germany in the period 1871–1941, its national objective has always been to emerge from each war in a superior military, political, and economic/social position relative to that of its defeated adversaries. In so doing, it attempted to minimize friendly casualties and to restrict the damage to its vital industrial and social infrastructure. Full mobilization of its relatively large force structure reduces the daily generation of domestic GNP by about one quarter. Such mobilization also increases daily defense expenditures by at least a factor of three, escalating daily defense expenditures rapidly to the equivalent of about 50 percent of the GNP. The impact of any sustained period of full mobilization would be economically devastating.

Moreover, in a small country like Israel, the cost of military action is disproportionately high in both human and economic terms. The very efficiency of Israel's defense system creates its Achilles' heel. Approximately 20 percent of the population are under arms and the best and brightest go in harm's way. Therefore, absolute battlefield victories can generate relatively high casualties. Also, over the previous decade, each year as much as 10 percent of the

GNP was invested annually in the procurement of military hardware. Therefore, the cumulative replacement value of the IDF's kit is now well over a full year's GNP. Israel cannot afford to replace substantial combat equipment losses. Any war that is not short and relatively low in material and personnel casualties is not acceptable. Moreover, because its long-term objective is to live in peace with its current enemies, Israel must attempt to minimize the impact of any war on its defeated adversaries. To meet this goal, it should not inflict disproportionate casualties on Arab armies or societies. It must strive to fight "clean wars" against the enemy's armed forces rather than his civilian rear and to minimize the possibility that wars will escalate to include attacks on strategic/economic targets.

The principles of maneuver warfare coincide with the Israelis' need to fight short, clean wars, particularly in the sense that Arab armies can be collapsed by using strategy and tempo rather than direct and bloody attritional assault. The Israelis first learned to substitute maneuver for assault during the bitter 1947-49 war of independence, when they lacked adequate suppressive firepower to overcome Arab defensive positions.² Subsequently, long contact with their Arab enemies convinced the Israelis that Arab armies cannot sustain high-tempo operations.³ With its forces fighting outnumbered, the Israeli General Staff has generally been able to define the center of gravity and to use space and time in order to concentrate adequate numbers of its best troops, thus generating a decisively favorable local correlation of forces. Because of their use of a reserve force structure and a high/low material mix, Israeli formations vary considerably in quality, in both human and technological terms. Israeli success in combat has been highly dependent on the General Staff's ability to selectively allocate combat resources—that is, to ensure that its best personnel are placed in position to most decisively influence the outcome of any operation. This once again coincides with the principles of maneuver warfare.

While the geostrategic disadvantages of a small country are obvious, its small size can assist maneuver warfare. Before 1967, the distance from Haifa on the Mediterranean to the Syrian border on the eastern shore of the Sea of Galilee was only about 80 kilometers. From the central southern town of Beersheba to the Egyptian border it was 50 kilometers, whereas Tel Aviv itself was only about 23 kilometers away from the Jordanian border. Therefore, the IDF was, and still is, in the advantageous position of having short lines of communication. It was able to support its forces from well-prepared "peacetime" bases and depots and also to switch forces rapidly from one front to another while making use of internal lines. To maximize these advantages, the country's infrastructure has been built in such a way that all civilian facilities could be mobilized for military use following well-planned, regularly rehearsed procedures. For example, in 1967 the most important hospitals already had helicopter landing areas and could rapidly be converted to handle military casualties.

The relatively small distances between fronts (250 kilometers between the Golan region and Negev border) and the mountainous character of much of the terrain has also meant that virtually all military units and supplies move by road. However, the IDF has never procured adequate numbers of specialized military transport vehicles to support its fully mobilized force structure. To this day, it owns less than 20 percent of the military transport vehicles needed to support its full force structure. Therefore, reserve divisions and most high-level transport units depend on the use of mobilized civilian vehicles for logistic support. Although the Israeli civilian infrastructure now has a large number of modern diesel-powered heavy trucks, it has few with effective cross-country mobility. Therefore, the supply columns of the IDF remain relatively roadbound. But conversely, Israel has an adequate metalled road network to support its military system primarily because the General Staff

influences the country's transportation planning. Thus, for example, the new main road between Haifa and the Golan Heights is wide enough to handle passing tank transporters, and sections of the older, narrow, tree-shaded road have been left intact as convoy resting areas.

Supplies are generally shifted from central depots by large semitrailers or heavy trucks to distribution points located relatively far forward. These supplies are then directly loaded onto combat vehicles or transferred to the IDF's limited number of military cross-country vehicles for transshipment forward. There are now two exceptions to the deficiency in specialized military transport. First, after 1973, the IDF procured a relatively large number of specialized tank transporters. This enables the General Staff to shift division-sized forces fairly rapidly over long distances. Second, the IDF currently operates a relatively large number of M-548 tracked cargo vehicles and updated half-tracks that are used as armored resupply vehicles. These vehicles are particularly useful for transferring palletized, ready-service ammunition or fuel forward to armored units in contact with the enemy.

Operation Desert Storm proved once again that in the unique clear weather and open terrain of the Middle East, air superiority is a prerequisite for military success in conventional warfare. This is particularly true for Israel, which depends on the smooth and rapid mobilization of its reserves. Therefore, a high proportion of the Israeli Air Force (IAF) consists of regular-manned squadrons that are adequate in strength to ensure air supremacy over Israel. Moreover, these regular squadrons can launch major air attacks pending reinforcement by IAF reserves. Besides permitting efficient mobilization and movement of reserve forces, air superiority provides compensating firepower for outnumbered IDF regular/conscript ground formations; allows the Israeli General Staff to use the IAF to shape and influence the battlefield; provides a highly mobile base of firepower that can be readily allocated by the General

Staff in accordance with its priorities; and provides both an air defense umbrella and strategic deterrent against Arab air attacks on Israel's vital civil/military infrastructure.

The instrument responsible for all these missions, the IAF, is not and never has been a separate service. Rather, it is a branch like armor or engineers. However, unlike the ground force branches, the headquarters of the IAF also functions as an operational wartime theater command in addition to its peacetime administrative and force-building roles. IAF headquarters is operationally responsible for air defense, air supremacy, and all operational and strategic missions. Control of all close air support/battlefield air interdiction (CAS/BAI) strikes within a classified distance from the forward edge of the battle area (FEBA) (estimated to be 30 kilometers) is in the hands of the three ground force theater commands, which effectively function as army-level headquarters. The navy's headquarters functions also as the fifth theater command. As directed by the General Staff, IAF headquarters allocates squadrons to the area commands for CAS/BAI.

Coordination of air and ground operations is currently carried out by a special air operations office largely staffed by IAF personnel within each of the area commands. This office allocates sorties and determines the required air-to-ground ordnance mix based on the requirements of the area commander. For example, an A-4N Skyhawk squadron with 20 operational aircraft might be able to generate up to six sorties per day per aircraft. The area commander, depending on the nature of the ground battle, might require continuous strikes on a specific enemy logistics axis or a mass strike on a prepared fortification. In the former case, four flights carrying cluster munitions might be spaced continuously about 24 minutes apart. In the latter case, the entire squadron might hit a specific target with delayed, fuzed iron bombs at a prearranged time. Further down the ladder of command, Israeli corps, divisions, and brigades have their own dedicated forward

air control units, also manned by IAF personnel, to provide control of allocated sorties.⁴

Finally, the IAF is also responsible for all Israeli helicopter formations and all ground-based air defense assets (including both guns and missiles), as well as for all surface-to-surface missile systems used for the air operation. Once again, tactical control of these systems can be delegated to the theater area commands, corps, divisions or brigades, as appropriate, or be maintained by IAF headquarters. This decision is made by the General Staff in accordance with its priorities.

Of all the wars waged by Israel, the Six-Day War of June 1967 was perhaps the most successful. The IDF fought three separate campaigns, evicting the Egyptian army from the Sinai Peninsula in four days, the Jordanian army from the West Bank in two and one-half days, and the Syrian army from the Golan Heights in just one and one-half days. As part of the campaign, the Arab air forces were destroyed in an air operation that lasted only about seven hours. These victories are correctly viewed as outstanding examples of maneuver warfare.

Both the Arabs and Israelis had about three weeks to mobilize, deploy, and prepare their military forces for the Six-Day War. Israel's Southern Command, which is the one that concerns us here, deployed three division-sized task forces (*ugdas*)—under generals Israel Tal, Ariel Sharon, and Avraham Yoffe—as well as three independent brigades that faced seven Egyptian divisions. About 650 Israeli tanks faced about 960 Egyptian tanks. The IAF had about 230 French-built combat aircraft deployed at four to five main bases. They included Mirage IIIC, Mystere and Super Mystere fighters, Ouragan attack aircraft, and Vautour light bombers. Except for the Vautours, none of these aircraft was able to carry a significant load of ordnance. The relatively low-powered fighters, while able to carry some bombs, were rather unmaneuverable when fully loaded and thus not really suited for the close-support mission. This left about 50

operational straight-wing Ouragans—slow, easy-to-fly platforms well suited for the ground attack role. However, their ordnance-carrying capability was limited to less than one ton (908 kilograms, to be exact).

Opposing the IAF, the Egyptian air force had about twice as many fighter/attack aircraft as did Israel. They included SU-7, MiG-21, MiG-19, and MiG-17 fighter/interceptors as well as 60 medium and light bombers capable of inflicting serious damage on Israeli cities, or at least, presenting a significant psychological threat. Thus, on paper, the “bean count” was strongly against Israel; moreover, the overall technological quality of Egypt’s Soviet military equipment was probably superior to the hodgepodge of equipment employed by Israel. The Egyptian air force also enjoyed another advantage in that its airfields were more numerous and less closely packed together, thus theoretically making surprise attack difficult.

The unique terrain of the Sinai Peninsula dictated the terms of Egyptian-Israeli combat. The peninsula’s southern triangle consists of untraversable mountainous areas. The region along the Mediterranean coast consists of soft, sandy dunes that are impassable to most wheeled or tracked vehicles. A north-south ridge line runs some 30 kilometers parallel to, and east of, the Suez Canal. There are only three major routes that traverse this ridge line: one through Bir Gifgafa on the sea, one through the Mitla Pass, and one through the Gidi Pass. An interlocking series of hills, sand seas, and wadis located in northeastern Sinai blocks entrance to the central Sinai region, which is generally traversable. Only three metalled routes cross the Sinai in an east-west direction: one isolated route along the coast and two routes through central Sinai. All three routes pass through the northeastern part of the peninsula.

Military logic should have suggested that Egypt hold the bulk of its concentrated armored forces in reserve along the north-south ridge line in the western Sinai. This would have forced Israeli units to fight their way through prepared

fortifications set well forward in the northeast quadrant of the Sinai before coming up against the main Egyptian units. Egyptian armor would then have been in position to hold overextended IDF forces at bay in a long attritional war that Israel could not afford, circumstances permitting, to launch a decisive counterattack against tired and ill-supplied IDF units. However, the political events leading to the war did not permit such a deployment, even if it had been considered. Intra-Arab considerations forced the Egyptian army to locate almost all of its forces well forward. Only one armored division was held in operational reserve. Moreover, the Egyptians did not concentrate their armor. Rather, each Egyptian infantry division was allocated a small armored force.

The Egyptian center of gravity was in the south, where forces were positioned to launch an offensive towards Hebron to link up with Jordan and cut off the southern Israeli city of Eilat. This deployment coincided with a major Israeli deception plan indicating that the Israelis intended to follow the same southern, indirect cross-country approach used by Israeli paratroopers during the 1956 Sinai campaign. In fact, however, the southern portion of the Negev Desert was only defended by one IDF tank brigade. Eilat did not even merit that, being defended only by regional defense units made up of reservists. The IDF's center of gravity was far to the north, opposite the strongly fortified Egyptian-defended blocks on the routes leading to the major east-west axes that traverse the Sinai.

The IDF's initial operational plan, drawn up by the General Staff under Lt Gen Yitzhak Rabin, was limited to the conquest of the Gaza Strip and the El Arish-Rafa fortified area. Subsequently, the plan was modified to include the capture of the entire peninsula up to a line 15 kilometers from the canal and the destruction of the Egyptian army. Even so, the nature of maneuver warfare required that only the operations of the first day—leading to an advance of some 40 kilometers—be planned in any detail.⁵ The remainder of the campaign was left to circumstances as

well as to the discretion of the front (corps) commander, Maj Gen Yeshayahu Gavish.

Focusing on the first day, the IDF's plan was to break through on two parallel axes (fig. 9). One division would assault prepared Egyptian fortifications on each axis. The assault on the coastal route was launched by the Tal *Ugda*, which had about 250 high-quality tanks. Further south, the major Egyptian fortified area covering Abu Ageila was to be overcome by the Sharon *Ugda*, consisting of one armored and two infantry brigades. One IDF armored brigade of the Yoffe *Ugda* would pass between the two attack axes, crossing difficult terrain that the Egyptians had considered impassable; its mission was to block the line of advance that any Egyptian counterstroke launched towards the coastal route would have to follow. The other armored brigade of the Yoffe *Ugda* would initially be held in Southern Command reserve. El Arish was to be taken in a combined airborne-amphibious night assault. Subsequently, the armored elements of all three IDF divisions would meet in the center of the peninsula at Jebel Libni where they would be rested, resupplied, and reformed. They would then be in position to meet the anticipated counterattack by Egyptian strategic armored reserves, should it come. This plan was not conditional on the outcome of the air operation, which was to be conducted simultaneously with the ground attack. The attack westward would have been conducted at night had circumstances so dictated.

The IAF's attack on the Egyptian air force started at 0845 (Cairo time) on 5 June, the hour being dictated by the fact that Israeli units (both air and ground) lacked effective means to engage in night combat and also in the hope of catching the enemy after the time of peak watchfulness early in the morning.⁶ Taking an extreme risk by leaving behind only about 4 percent of the available aircraft to defend the country's own skies, the Israelis launched their entire force on a highly prioritized target array—19 Egyptian air bases holding bombers and high-quality fighter aircraft.

Using battle-damage assessments, the Israelis subsequently added other targets, including additional air bases holding lower-priority aircraft and air search radar sites. The IAF attack was organized in two waves separated by a short period that was required for assessment purposes. Each wave was organized into successive flight-sized echelons that were spaced seven to 10 minutes apart. Each flight made a single pass, dropping bombs to crater runways and thus pinning down Egyptian aircraft. They then returned for multiple strafing attacks. First-priority Egyptian air bases were therefore under almost continuous attack until virtually all the grounded first-line aircraft were destroyed. Multiple-pass strafing runs maximized the vulnerability of attacking IAF aircraft to Egyptian anti-aircraft fire. But it was the only way feasible for the IAF to kill large numbers of aircraft with the means at hand. In 1967 the IAF killed more than one aircraft on the ground per attack sortie. During the Suez crisis in 1956, the more conservative British and French air forces, using somewhat similar aircraft and weapons, had killed less than one Egyptian aircraft for each five attack sorties during their initial high-altitude raids.⁷

Owing to excellent training, repeated detailed rehearsals, and the use of appropriate tactics and weapons, the Israeli air operation was an immense success. In 347 total sorties, the IAF destroyed 304 aircraft, including virtually the entire Egyptian bomber force, and all but neutralized the enemy ground-based air defense system by destroying 16 air search radars. Israel's own losses numbered nine aircraft, which was a very high loss rate of over 2.5 percent of missions flown. However, it was a price the General Staff and IAF Headquarters were willing to pay to achieve their goal of air supremacy.⁸

Meanwhile, between H hour and H+9 hours, the advance of the Tal *Ugda* proceeded faster than anticipated, largely because of the high quality of the IDF's conscript/regular elite 7th Armored and 202d Paratroop brigades, the latter acting in the mechanized infantry role. The Tal *Ugda* had

Israel's best troops and equipment. By sunset, one battalion of Centurion tanks had broken through the heavily fortified Giradi defile and arrived west of El Arish. So fast was the advance that the planned night amphibious/paratroop assault could be canceled. The tempo of IDF operations, as well as the readiness of subordinate commanders to take risks and display initiative in accordance with mission-type orders, had shattered the opposing Egyptian infantry division.⁹ The latter was not able to take advantage of poor Israeli command and control at the divisional level¹⁰ and the inability of the Israelis to rapidly resupply their exhausted and strung out forces.

During the daylight hours of the first day of combat, the Sharon *Ugda* closed on its target, overrunning outlying defenses and moving up its relatively immobile infantry and artillery across the dunes towards Abu Ageila.¹¹ General Sharon was given the choice of launching a night attack or waiting until daylight, when he could attack with the full support of the IAF. He opted for a combined arms night attack, organizing a typically complicated operation that combined a number of elements. First, blocks made up of deeply inserted armored units were used to isolate the battlefield from reinforcements coming from the north and the south or west. Next, paratroopers were inserted by helicopter to the rear of the Egyptian fortifications and used to overrun artillery positions.¹² Third, artillery and tank fire were used to suppress Egyptian trench lines, enabling Sharon's own infantrymen—carrying colored lights on their shoulders for identification by friendly units—to overrun the trench lines. Meanwhile, engineers opened a route through the mine fields and obstacles originally covered by the trenches and artillery. Finally, armor penetrated the defensive zone through the gaps made by the engineers and engaged and defeated the Egyptian armor that had been held in tactical reserve.

That night, as expected, the Egyptians launched a two-brigade counterstroke north from Jebel Libni towards El Arish.

It was the only one organized by them during the entire campaign; however, it was held through the night by a blocking Israeli tank battalion from the lead Yoffe brigade.

By H+24 hours, the IDF had overcome the Egyptian forces in the northeastern Sinai and obtained access to the vital and limited Sinai road network. Egypt's Sinai command had been subject to a violent one-two punch. Within 24 hours, their seemingly impregnable defenses in the northeastern Sinai had collapsed, their counterstroke had been foiled, and the IAF now owned the air above the Sinai Peninsula. However, only about 200 of 960 Egyptian tanks had been engaged, destroyed, or captured. Only one and one-half of its seven divisions had been assaulted. The rest remained largely in place. But at this point, the Egyptian high command located in Cairo panicked and ordered the evacuation of all Egyptian forces from the Sinai Peninsula. This was a catastrophic error.

Between H+24 and H+36 hours, the Tal and Yoffe *ugdas* easily penetrated the Bir Lahfan fortified area, which was already in the process of being evacuated by the defenders. They defeated the retreating counterstroke force and captured Jebel Libni and Bir Hama, both of which had already been largely evacuated. That night the IDF correctly adjusted its battle plan. Without resting, reorganizing, or resupplying, the five armored brigades of the three IDF divisions were ordered to rapidly deploy westward in order to put blocks in place along the ridge-line passes in the western Sinai. This maneuver combined the strategic offensive with the tactical defensive. Although the IDF forces used for these blocks were undersized and often short of supplies, they faced an opponent that had lost all cohesion and totally lacked effective command and control. Approaching the Mitla and Gidi passes in their attempt to escape, the Egyptian motorized columns were ambushed by Israeli armor and devastated. This accomplished, the same Israeli units penetrated further westward on the fourth day of the war

and reached the Suez Canal, even though their original orders had been to stop on a line well short of it.

As the *Tal Ugdá* stormed forward on the first day, it received close air support from two squadrons of armed Fouga Magister trainers—the only forces that the IAF, engaged in its preemptive attack against the Egyptian air force, had available for that purpose. The idea was to help the armor forward by blasting the Egyptian artillery formations; however, it turned out that the latter were too well fortified and camouflaged. The Fougas themselves were unarmored and did not even have ejector seats. Their sole armament consisted of light 7.62-mm machine guns and 68-mm/82-mm rockets. As a result, their effectiveness in this role tended to be somewhat limited.¹³

Later in the campaign, this situation changed. Having successfully defeated the Jordanian, Syrian, and Iraqi air forces in addition to the Egyptian one,¹⁴ the IAF on the second day of the war turned back to the Sinai, where it enjoyed complete command of the air. Dakota and Nordatlas transport aircraft played a vital role by supplying fuel to the units from Tal's and Yoffe's *ugdás*. Had it not been for them, the Egyptian breakout might conceivably have succeeded. Air supply was also used to fill up the Sharon *Ugdá*, which, following its victory at Abu Ageila, moved southwest towards Nakhle. Meanwhile, every type of combat aircraft was used to interdict retreating Egyptian vehicle convoys. The method selected was for Southern Area Command to set moving bomb lines, which were constantly updated by rear headquarters at Ze'elim, in the western Negev. All ground forces beyond these bomb lines were considered to be hostile. Generally, the IAF worked west to east against Egyptian motorized columns, which being roadbound and having limited mobile air defense assets, were easy to find in the totally open terrain. Having found their quarry, IAF pilots could loiter over the target area and make multiple pass attacks.¹⁵

Postaction review of the battlefield showed that IAF aircraft had great success against soft vehicles, thousands of

which littered the desert either as burned-out wrecks or intact vehicles that had been deserted by their terrified crews. However, IAF aircraft with their rockets, iron bombs, and 30-mm low-velocity cannons were found to have almost no capability against armored vehicles. Virtually none of the 890 tanks lost by the Egyptians were directly destroyed by Israeli air power.¹⁶ It is also interesting to note that, as had been the case during the German campaign of 1940, the IDF made virtually no use of close-air-support sorties precisely controlled by ground-based observers; instead, the IAF chose the simpler method of operating well forward, concentrating on the interdiction mission. As previously noted, the way at least one Israeli commander saw the strengths and limitations of his own air force was illustrated by General Sharon. Given the choice of a daylight ground attack, with the full participation of the IAF, or a night attack, he opted for the latter. He thus expressed disbelief in the capability of the IAF to destroy hard targets, a capability which in fact it did not possess.

Finally, an unspectacular but very important way in which the IAF supported maneuver warfare during the 1967 campaign was by providing protection for the operations of the IDF's vulnerable motorized logistics columns. The three *ugdás* deployed in the Sinai had only very small organic transport vehicles that could be loaded with no more than 72 hours worth of ready service supplies. The convoys coming up behind them were made up of roadbound, requisitioned, civilian vehicles of every sort and description. The nature of the terrain forced them to pass through several narrow and dangerous defiles and the traffic discipline of their civilian drivers was of the kind that can only be learned on the streets of Tel Aviv. To cap it all, the resources allocated by the IDF to mobile anti-aircraft protection were virtually nil. Had it not been for the IAF, the supply columns would have represented ideal targets for air attack, and scenes such as took place in 1956 when a single such attack by the Egyptian air force scattered an

entire convoy might have been repeated. In the 1967 event, the IAF's command of the air was almost absolute. By permitting the Israeli supply columns to advance safely by day as well as by night, it made another substantial contribution to the outcome of the campaign.

The campaign ended with catastrophic results for Egypt. The latter's armed forces had lost virtually all their aircraft (though not their pilots, most of whom survived to fight another day), about 890 of 960 deployed tanks, and a proportionate quantity of other heavy equipment including artillery, troop carriers, and trucks that could be seen in Israeli depots for years after the campaign. An area 60,000 kilometers square, offering several excellent possibilities for the defense, had been occupied. Egypt's casualties reportedly numbered 11,000 fatalities. Israeli losses were approximately 40 aircraft (including those lost on other fronts) and 61 tanks, some of which were later salvaged. On the Sinai front alone there were fewer than 300 fatalities, most of them suffered during the tough breakthrough battles.

During the years 1967–73, the IAF was greatly reinforced despite an ongoing French arms embargo started in 1967. While its original French-built aircraft were slowly becoming inoperable for lack of spare parts, it began to substitute home-built Nesher aircraft that were really austere Mirage Vs fitted with American engines. At the same time, it received large numbers of capable, American-manufactured A-4 Skyhawk and F-4 Phantom aircraft. The number of Israeli fighter bombers, which had been around 230 in 1967, rose to 410. Unlike the French aircraft, moreover, the newly received American-built ones were well suited for carrying considerable amounts of ordnance. The total disposable payload (external fuel included) carried by all IAF combat aircraft rose from approximately 570 tons to 2,000 tons. Meanwhile, the IAF's lethality against ground targets improved by a factor of over 12—an increase partly due to the fact that some of the newly acquired aircraft (the Skyhawk A-4N) possessed computerized navigation attack

avionics that increased the accuracy of air-to-ground sortie lethality by a factor of about three and one-half times.¹⁷

As it fought the so-called war of attrition against the Egyptians in 1969–70, Israel's perception of its air force changed considerably. Whereas previously the IAF had been used to cover and protect fast-moving troops engaged in maneuver warfare, it now found itself used as flying artillery in static attritional battles along the Suez Canal. Previously it had avoided attacks on civilian targets in an effort to break the Arab armed forces, but from late 1970 on it was used as Israel's "long arm" in an attempt to topple Egyptian President Gamal Abdel Nasser by flying missions into the Egyptian rear and thus showing the population that the regime was unable to protect them.

At first, the anti-aircraft defense environment in which the IAF operated was relatively benign, enabling the Israelis to fly and bomb almost with impunity. However, Nasser went to Moscow in January 1970. He begged the Soviets to help him rebuild his anti-aircraft defenses, threatening to resign if they did not, "which would prove that the Americans are masters of the world." Thereupon the Kremlin sent advanced aircraft and pilots, radars, SA-2, -3, -4, and -6 missiles, ZSU 23-4 anti-aircraft guns, and several thousands of its own technicians to maintain and operate them as well as to instruct the Egyptians in their use. These measures did not take long to have an effect. Within three months, growing losses as well as the fear of bringing about a clash with Soviet pilots who were flying missions over Egypt had forced Israel to call off its deep strikes against Egypt. Attacking targets such as troop concentrations, vehicles, and artillery positions along the canal, the IAF was still able to inflict heavy casualties but only at a mounting cost in aircraft and crews. By the time the struggle ended in August 1970, both sides were thoroughly exhausted. Still, one may argue that it was the Israelis who learned the wrong lessons. Too arrogant to admit that their vaunted air force had been fought to a standstill, they mistakenly thought

that they would still be able to operate as flying artillery at acceptable costs.

By 1973, the new strategic situation on the ground along the Suez Canal was no longer conducive to the bold maneuver warfare so vividly illustrated during the 1967 campaign. As we saw, Israeli strategic requirements up to 1967 had led to a military policy preemption. The bulk of the Egyptian army was located in the Nile Delta, and Jordanian armored brigades were located east of the river Jordan and the formidable geographical obstacle provided by the mountains of Judea and Samaria. Both Arab countries lacked a bolt-from-the-blue surprise attack option. Hence, Israel would be provided with strategic warning by Arab troop movements. It could mobilize and launch a preemptive attack before these Arab deployments were complete, or prompt mobilization could deter Arab force buildups and compel the removal of forward-deployed Arab forces. In 1967, the Israeli government vacillated after Egypt deployed into Sinai. Deterrence failed because the Arabs perceived the Israeli government as being weak and indecisive. Finally, after a great internal debate, the IDF was politically freed to launch the preemptive attack. This attack was expected by the Arabs. What the Arabs did not expect was the magnitude and success of that attack.

By contrast, 1973 saw Arab and Israeli forces closely engaged along the 1967 cease-fire lines. The Egyptian military was separated from Israel proper by the relatively wide Sinai Peninsula. Egypt's short-range Soviet strike aircraft lacked the payload-range characteristics needed to threaten IAF air bases from their bases in the Nile Delta. The absence of such a threat made Israel feel secure. Israel had become politically aligned with the United States, whose power was needed to offset that of Soviet-backed Egypt. The United States would not condone an Israeli preemptive strategy. Therefore, the Israeli government led by Golda Meir concluded that with the new borders, and under the existing political conditions, a preemptive strategy was no

longer feasible. Israel planned to absorb the first blow before launching a decisive and rapid counterattack.¹⁸

Meanwhile, Israeli lines of communications, particularly in the Southern Area Command, were vastly expanded. IDF reserve depots (as opposed to those of the regular forces) remained in the Negev Desert, located over 200 kilometers from the Suez Canal. Israeli General Staff planning was based on at least 48 hours of strategic warning, which would enable it to mobilize and to deploy the reserves forward. The Israeli plan was to have one reinforced, forward-deployed, regular/conscript tank division withstand the Egyptian cross-canal attack. Two reserve IDF tank divisions would be called up and be deployed in the Sinai. The three divisions together would launch a cross-canal counterattack on the third day of the war. It was assumed that during the first two days of the war the IAF would be almost fully involved in an air operation designed to neutralize the Egyptian air force and destroy the ground-based Egyptian air defense system. The Israeli cross-canal attack would therefore benefit from the full support of the IAF. To rapidly cross the canal, the Israelis had developed preconstructed roller bridges. Crossing could be accomplished from a prepared east bank in minutes, not hours. In addition, Israeli tank units had been reorganized since 1967. Instead of flexible *ugd*s, the three armored divisions that were either in the Sinai or earmarked for it had three tank brigades of three tank battalions each, plus an artillery brigade. They lacked the combined-arms balance of the 1967 Tal *Ugda*, which had four organic mechanized infantry battalions and self-propelled 81-mm mortars at the battalion level.

The Israeli intelligence service correctly estimated that the Arabs could not militarily defeat Israel unless they could decisively strike IAF airfields. They therefore concluded, incorrectly, that Egypt and Syria would not go to war. Obvious movements of Arab forces and other warning signs reported by Israeli intelligence were ignored. Israel was

caught unprepared. The mobilization of Israel's reserves was ordered only five hours before the onset of hostilities.¹⁹

The Israeli defense plan for the Suez Canal had been drawn up under the direction of Lt Gen Haim Bar Lev (chief of staff, 1968–72).²⁰ It was decided to have an elite infantry platoon together with a tank platoon in each of the forts along the canal. The forts were to be provided fire support from tank platoons or companies operating from prepared elevated firing ramps located to the immediate rear. Tank battalions were to be in tactical reserve with a tank brigade held in operational reserve. The plan's main fault was that these forces were tank heavy, lacking adequate infantry, mortar, and artillery support. Correctly implemented, however, the plan would have vastly slowed the Egyptian crossing. Not executing the defensive plan was a great mistake.

When the Egyptians launched their attack at 1400 hours on 6 October, the Bar Lev line along the Suez Canal was for all practical purposes undefended. Overconfidence among the leadership at Southern Area Command (Maj Gen Shmuel Gonen) had led to a situation where the forts were only manned by approximately 460 second-line, largely reserve infantry who were supported by fewer than 10 tanks. One tank brigade was 20–30 kilometers deep and two others were 60 kilometers back. Two reserve tank divisions were being hastily mobilized in the Negev. Egypt had achieved strategic surprise, indeed to the point where it took the Israeli General Staff some 48 hours to realize that this was war and not just another one of those skirmishes that had marked the canal front between 1967 and 1970 (on the Syrian front until 1972). Surprise meant that Israeli first-line armor was initially maldeployed and the rest was 200 kilometers away from the scene of hostilities.

Given a superiority of fire of about 50:1, Egyptian artillery easily suppressed fortifications on the Israeli side of the canal. Egyptian infantry were able to cross the canal virtually unopposed. They immediately dug in, heavily

reinforced by additional man-portable antitank systems, within the range of the Egyptian antitank guns, tanks, and antitank guided missile launchers still located on the west bank of the canal.²¹ Israeli tanks were launched forward in penny-packet platoon or company-sized units to link up with Israeli forts. Israeli tanks lacked combined-arms support from mechanized infantry, mortars, engineers, and artillery. Like overripe fruit, the Israeli infantry, trapped in their useless and bypassed fortifications, lured Israeli tankers, intent on their rescue, forward to their destruction. Within 36 hours, the regular/conscript Israeli tank division had lost about 65 percent of its tanks and had accomplished little.²² The Egyptians were able to successfully consolidate their now-continuous but shallow bridgehead. As Israel had done in 1967, Egypt successfully combined the strategic offensive with the tactical defensive.

On the third day of the war, the two deployed Israeli reserve tank divisions attempted to regain the initiative. But they had deployed without their artillery, which was still on the roads into the Sinai. They were tank-heavy units that lacked the combined-arms support needed to deal with Egyptian infantry. The plan was for each Israeli division to roll up one-half of the Egyptian forces along the canal by attacking on a north-to-south line running just out of the range of Egyptian antitank fire. The plan was flawed. The Egyptian forces were still hard up against the canal, and there was no flank to roll up. One division (Maj Gen Avraham Adan) ultimately launched a series of frontal, battalion-sized tank assaults. They were all decisively defeated.²³ The other division (Major General Sharon), holding vital ground east of the canal, was ordered to disengage and move south, based on a totally erroneous misreading of the ongoing battle by the leadership of the Southern Area Command. The Israeli armored attacks had failed because of inferior generalship, poor command and control, and lack of combined-arms support. The Egyptians were able to expand their shallow beachheads eastward

against the maldeployed and exhausted Israeli armor; even so, they never advanced more than eight or so kilometers east into the Sinai Peninsula.

During the 1968–70 war of attrition, Israel had built up a valuable infrastructure in the western Sinai to support the armored division permanently deployed there. Subsequently, this infrastructure limited Israeli tactical options. Rather than squander tanks in ill-advised assaults against overwhelming antitank defenses, it would have been preferable for the IDF to stretch the Egyptians out, draw them away from their relatively static air defense network, pin them down, outflank them, and destroy them by superior Israeli armored formations in mobile battles deep in Sinai—in short, engage in maneuver warfare. This was not to be the case.

Between the fourth and eighth day of the conflict, the Sinai front was relatively static. The IDF's three tank divisions were resupplied, regrouped, and reinforced. Two other composite Israeli divisions were formed and deployed. The Egyptians, no doubt taken aback by their own success,²⁴ consolidated and fortified their now five-division-strong defensive zone. A strong operational reserve force of three Egyptian armored and mechanized divisions remained on the west bank of the canal, ready to react to any Israeli cross-canal counterattack.

On the ninth day of the war, the Egyptians launched an offensive to take the pressure off their Syrian ally, using the armor of their infantry divisions and elements of two tank reserve divisions, which had also crossed the canal.²⁵ The Egyptians attacked on five major axes. IDF tankers met and defeated their armor with a kill rate of 256:6. The Egyptian attack lacked a center of gravity. On none of the axes did the Egyptians obtain an adequate correlation of forces necessary to overcome qualitatively superior IDF armor. But the Israeli defense was equally flawed. Too many Egyptian tanks survived. The Israelis had an opportunity to draw Egyptian armor deeper into the Sinai, to pin it with their air

power (operating outside the Egyptian air defense envelope), and destroy it with a decisive counterstroke. The IDF very successfully fought to defend sand and space that should have been yielded in order to achieve more decisive results. On the other hand, in shifting its armor eastward, Egypt had catastrophically weakened its reserves. It was now vulnerable to an Israeli cross-canal counterattack.

On the night of the tenth day of the war, the IDF launched its long-awaited cross-canal counterattack. The plan was to rapidly cross in the center at Ismailia north of the Great Bitter Lake and to sweep south behind the Egyptian Third Army, leaving its forces in Sinai without resupply (fig. 10). The reinforced Sharon Division made the attack with the Adan Division in reserve. These two divisions had 60 percent of Israel's best armor. Once again, the more mobile Israelis had been able to maneuver their forces, to the center of gravity and thereby establish a favorable local correlation of forces, although they were outnumbered overall. Because of poor planning and traffic control—a perennial Israeli weakness—it became clear that the IDF's raft-like bridge sections could not be brought forward that night.²⁶ But General Sharon declined to delay the start of the operation because he did not trust his military or political superiors, or so he later claimed.²⁷ Initially, the unopposed Israeli flanking move through the open seam between two Egyptian armies went well, but the lead Israeli tank and mechanized infantry battalions ran into violent opposition as they moved farther north. While this battle raged, an Israeli paratroop brigade and an armored battalion were ferried across the canal. They found the west bank undefended. The Egyptians didn't know the Israelis were there. The heartland of Egypt was totally vulnerable.

Israel's Southern Area Command restrained General Sharon, denying his request to shift additional armor westward. They wanted a secure corridor to the canal and firm bridges, not vulnerable ferries, in place. This decision was a great error and totally at odds with the basic principles

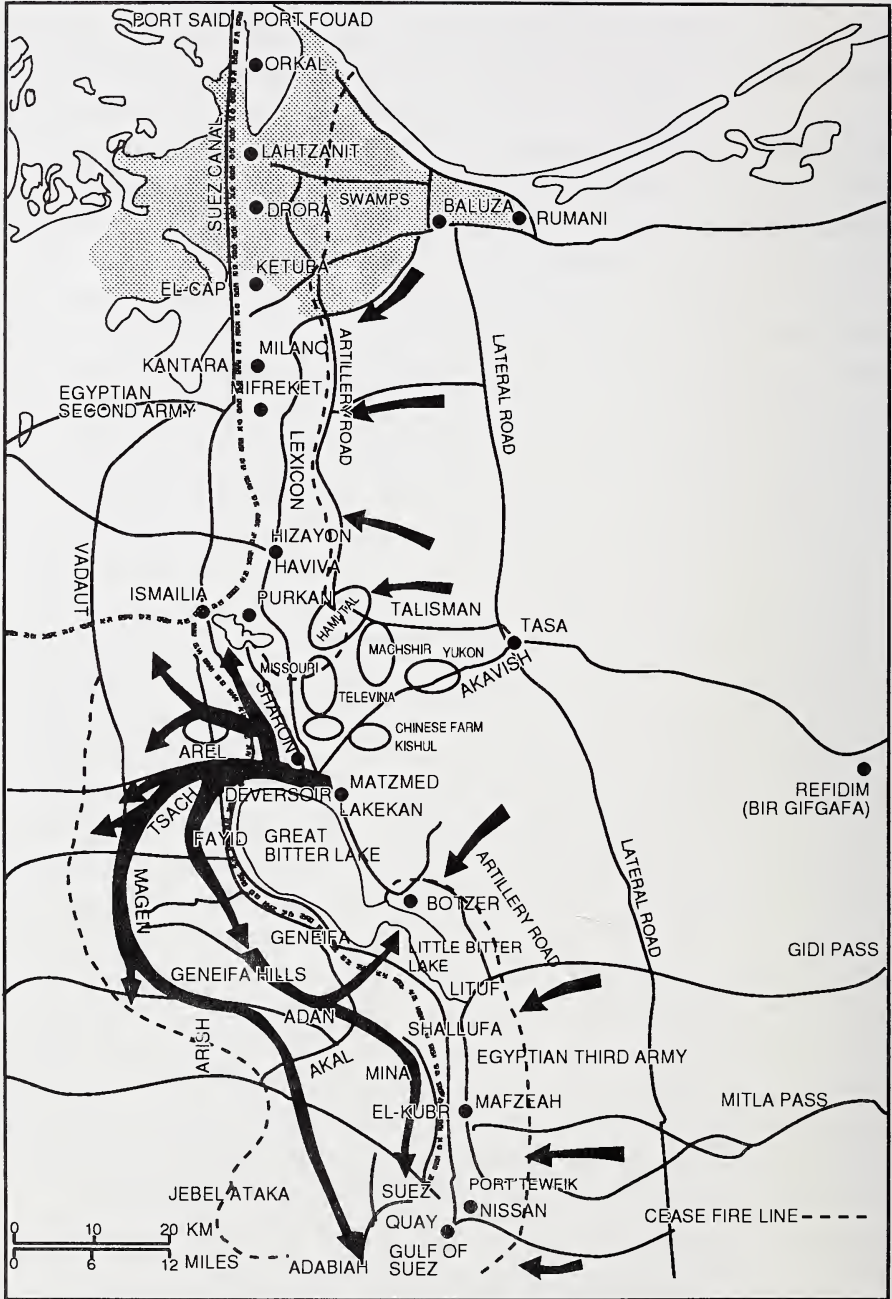


Figure 10. The 1973 Campaign in the Sinai

of maneuver warfare. The reduced tank battalion across the canal launched successful raids on nearby Egyptian facilities, but a great strategic opportunity was lost. The IDF had a unique opportunity to exploit a gap in the Egyptian array. They had an opportunity to engage in mobile, fluid, high-tempo operations. There is every reason to believe that the Egyptian command and control system would have collapsed, particularly if Israeli units had exploited westward into the undefended Nile Delta against vulnerable Egyptian depots and airfields.

Had an IDF force of 100–150 tanks broken out at midday on the eleventh day of the war in six battalion-sized combat teams, there is no way to estimate the magnitude of the probable Egyptian collapse. But the Israeli General Staff and its Southern Area Command read the wrong scale maps. They worried over 2–4 kilometers of killing ground around the northern flank of the Israeli corridor to the canal, concerned that Sharon's bridgehead could be cut off. It was a total misreading of the situation. The Sharon and Adan divisions battled for another 48 hours to secure the corridor and move the IDF's bridges forward. By then, the Egyptians had brought their artillery to bear on the crossing sites and moved limited reinforcements forward against the Israeli bridgehead on the west bank. The Adan Division battled its way out of the bridgehead and then slowly and carefully moved south. The Egyptian chief of staff wanted to pull back mobile forces from Sinai to the west bank to meet the developing Israeli offensive.²⁸ He was overruled by the minister of defense and the president. They correctly concluded that such movements would have exposed the Egyptian columns to IAF air attacks and would have led to the collapse of the Egyptian army. Against limited opposition, Israeli armor overran surface-to-air missile bases, allowing the IAF to participate in the ground battle. It took five days for IDF forces to battle their way southward toward the city of Suez, and the last supply lines to the Egyptian Third Army.

The war finally ended seven days after the Israelis bridged the canal with the Egyptian Third Army enveloped in Sinai. In the north, the main line of communications to the Egyptian Second Army was also controlled by IDF fire. Israel had lost about 600 tanks (300 of which could be salvaged) and 1,700 personnel versus Egypt's estimated losses of about 1,000 tanks (800 captured by Israel) and 12,000 personnel.

Between 1970 and 1973, the Egyptian military, violating the cease-fire agreement, had been able to deploy a dense ground-based air defense system to cover its deployed ground forces, which had short, well-protected logistical supply lines. In 1967 Egyptian aircraft had been neatly drawn up on the runways, ready to be picked off; by 1973, they were located in fortified hangarages that offered protection from strafing attacks. The hangarages could only be penetrated by direct hits from large bombs. Israeli aircraft lacked the avionics needed to ensure such hits. As in 1967, the IAF still depended on artillery fire control observers to control close-support sorties. While the allocation of sorties was controlled by an air force cell in each area command, there was only minimum air-ground joint planning. IAF air-to-ground lethality generally depended on operations in a benign air defense environment. IAF aircraft still lacked an effective ability to engage armored vehicles. It also lacked the real-time reconnaissance capability needed to allocate attack sorties on a confused, dynamic battlefield.

Within hours of the mobilization order, the IAF was prepared to launch a preemptive strike on Syrian air bases and air defense sites. The political echelon then intervened, ordering the IAF not to launch the strike. During prewar planning sessions, the IAF had indicated to both the political echelon and the General Staff that with the technical means then at hand, air attacks on ground-based, surface-to-air missile systems had to be precisely orchestrated actions. Therefore, the Israeli government decision not to order a preemptive strike significantly

impacted subsequent IAF operations during the Yom Kippur War of 1973. During the first afternoon of the war, it was all that the IAF could do to react defensively. It maintained strong combat air patrols over Israel, successfully intercepted Syrian and Egyptian attack aircraft and helicopters, and launched a limited number of air-to-ground attacks on Egyptian forces.

Consistent with its prewar planning, the IAF planned to launch a sustained air operation against Arab air forces and air defense systems on the second day of the war, with Egypt given first priority. However, as already noted, the IAF did not generally have the means to effectively engage aircraft within protected hangarages. Runways could be cratered and the aircraft pinned to the ground, but such damage could be fairly rapidly repaired. The IAF found that it could not repeat the dramatic success of its 1967-style counterair operation. Though air superiority was ultimately achieved, it was never quite complete.

Soon after the first wave of these attacks was launched against Egypt, the Israeli General Staff ordered the IAF into action against Syrian ground forces on the Golan Heights in the CAS/BAI or close-air-support/battlefield air interdiction role, before the Syrian air defense system was first attacked and suppressed. The IAF was sent to fill the gaps in Israeli defensive positions. Subsequently, it was ordered to conduct similar missions against the bridges that the Egyptians had thrown across the Suez Canal. This was a total contradiction of prewar Israeli planning. IAF headquarters recognized that the result would be relatively heavy losses and came to realize that the IAF could only have a limited impact on the ground battlefield. Nevertheless, caught by strategic surprise and its prewar estimates of the correlation of forces clearly wrong, the Israeli General Staff had no immediate alternative. Somewhat like the Luftwaffe during the later years of the Russian campaign, the IAF was being shifted from front to front and from role to role in reaction to immediate threats without implementing any cohesive air operational plan.

By the fifth day of the war, Israel had lost 54 aircraft shot down and probably had another 40 or so damaged aircraft under repair.²⁹ These losses had been offset to some extent by the return to service of fighter/attack aircraft in depot repair at the onset of the war. Because the IAF was caught by surprise, an estimated 85 percent of its aircraft were operational at the beginning of the war (about 335 of 390).³⁰ Based on published loss rates and the knowledge that just over two Israeli jets were severely damaged for each one shot down, we can estimate that the IAF probably had only about 280 operational fighter/attack aircraft—or about 70 percent of its initial inventory—left by the end of day five. It was approaching its self-defined red line, the minimum number of aircraft required to guarantee air supremacy over Israel. While the IAF had achieved decisive air-to-air kill ratios of about 20:1³¹ and had acquired air supremacy over the Sinai and Israel, it had neither successfully suppressed Arab air defense systems nor destroyed Arab air forces on the ground. Its air-to-ground attacks had been generally ineffective.

For the next six days of the war, available data indicates that the number of sorties generated was deliberately constrained as the IAF husbanded its vital aircraft fleet and developed technotactical responses to the Arab air defense system. The decisive breakthrough battle fought along the IDF's corridor to the Suez Canal, perhaps the bloodiest in the entire war, was made with only limited IAF support. In the final six days of the war, the Israeli sortie rate climbed again. In part this reflected IAF confidence in newly deployed electronic warfare systems, and in part it reflected the fact that the number of operational Israeli aircraft increased, thanks to rapid US air deliveries of replacement Skyhawk and Phantom aircraft and Israeli combat repairs of damaged aircraft. Moreover, the Israeli *ugdas* operating in "Africa" had now made a dent in the Egyptian SAM network along the canal. The result was a very substantial reduction in the IAF loss rate. About 65 percent of the IAF's

operational sorties represented air-to-ground missions. Of these, less than 10 percent were considered strategic strikes against targets in the Nile Delta or Damascus region. Most sorties were flown in the CAS/BAI roles and, on the whole, were quite ineffective.³²

Published figures show that the IAF was only able to fly a limited number of sorties on the first two days of the war. On the third through sixth day of the war, the IDF sustained a rate of about two sorties per day per operational aircraft. Between the seventh and fifteenth days of the war there was a period of reorganization during which the sortie rate was cut nearly in half. Late in the war, the IAF was once again able to generate nearly two sorties per operational aircraft per day.³³ On Saturday, 13 October, it was very effective in stopping an attempted Egyptian advance along the southwestern shore of the Sinai—perhaps its greatest tactical success of the entire war—once again proving the vulnerability of motorized columns operating outside an air defense umbrella. Between Monday and Wednesday, 15–17 October, it secured the canal crossing, though not to the extent of preventing all Egyptian air attacks against the crowded access roads.³⁴ Its contribution to the ground campaign, while considerable, was far from decisive.

To sum up, by achieving strategic surprise, the antagonists were able to prevent the IAF from launching a preplanned surge attack like that on 6 June 1967. During the first two days of the conflict, the IAF mobilized its largely reserve logistics system and recalled ground support personnel and pilots. Meanwhile, it was able to generate only 50 percent of its normal sortie rate and probably less than 33 percent of a maximum surge effort. Furthermore, by inflicting heavy losses at the outset of the war, the Arabs were able to reduce the IAF's sortie rate by nearly 50 percent for nine vital days. Consequently, the IAF was able to fly far fewer sorties during the war than it had planned. This, combined with inadequate command and control and

limited per sortie lethality, considerably reduced the impact of the IAF on the war as a whole.

Between 1967 and 1973, the IAF's fighter/attack aircraft inventory increased by about 77 percent. The maximum total deliverable payload grew by 350 percent, and air-to-ground lethality by 1,250 percent. In 1967, the loss rate per sortie was 0.014; by comparison, in 1973 it was only 0.0093. Yet the IAF had a decisive impact on the military outcome of the 1967 Six-Day War and far less impact in 1973. To derive any lessons from this comparison, we must ask why this was the case.

In 1967, Israel took the initiative and achieved operational surprise. In 1973, it was the Arabs who achieved strategic surprise. As a result, in 1967 the IAF was able to proceed with a high-tempo air operation that enabled it to rapidly achieve air supremacy on the first day, throwing the enemy off balance for the remainder of the war and preventing his recovery. In 1973, the IAF was unable to launch a high-tempo air operation, and it also lacked appropriate technotactical responses to the Arab's use of protected hangarages and dense ground-based air defense systems. In 1967, the IAF operated alongside Israeli ground forces that boldly executed the kind of maneuver warfare in which their opponents were weak and in which they themselves shone. Therefore, in 1967 the IAF was primarily engaged in interdicting vulnerable Egyptian motorized columns that were easily identifiable and poorly defended. In 1973, the IAF fought in support of Israeli ground forces that generally fought statically in attritional battles in which the initiative was often taken by the Arabs. Therefore, the IAF was primarily engaged in close air support against well-fortified, well-defended Arab ground forces on an often confused battlefield. Determination and a readiness for sacrifice on the part of the pilots notwithstanding, the IAF lacked the C³I capability, weapons, and avionics needed to succeed in this type of environment.

The relative failures of the IAF in 1973 therefore reflect certain doctrinal problems. First, the IAF was part of a

military force that was organized to fight the bold maneuver battles that were no longer politically or militarily feasible. Second, it was an air force that lacked the tightly integrated air-to-ground and ground-to-air C³I system needed for effective close-support operations. Finally, and perhaps most significant, the IAF's brilliant success in the 1967 Six-Day War and the war of attrition, and its overriding emphasis on air-to-air engagements, blinded it to its technotactical needs versus Arab hangarettes and ground-based air defense systems.

After the war was over, the IDF sought to learn its lessons and overcome its shortcomings by proceeding on a parallel three-track approach. First, it was necessary to replace war losses. Next, the size and quality of its force structure was considerably improved by the purchase of modern F-15 and F-16 fighter aircraft as well as Cobra attack helicopters armed with tube-launched, optically tracked, wire-guided (TOW) missiles. Finally, a concerted attempt was made to develop technological and tactical responses to Arab antiarmor and anti-aircraft capability, partly by purchasing avionics from the United States and partly by pushing indigenous solutions.

The first of these objectives was accomplished numerically within about three months, although the replacement of trained tank crew and tactical leaders took considerably longer. The second objective was substantially accomplished within 18 months, although again the buildup continued at an intense level for another two or three years. The third of these objectives was the most difficult to achieve, in part because technology did not yet exist to fulfill all Israeli operational requirements. To reconfirm its doctrine of maneuver warfare, Israel had to reestablish the preeminence of the tank and aircraft, whose effectiveness had been so significantly blunted during the Yom Kippur War. The answers were in part doctrinal, in part organizational, in part tactical, and in part technological.

As for the IAF, it had learned a number of lessons from the 1973 war. First, near real-time intelligence, a tight command and control cycle, closely coordinated planning between air and ground staffs, and a dedicated command system are needed for effective air-to-ground attacks in a dynamic battlefield environment. Second, to be lethal, air-to-ground attacks require suppression of medium- or high-altitude surface-to-air missile systems by soft- and hard-kill systems, a task that in the future would have to be carried out at least in part by ground forces using long-range artillery and other means. Third, it was necessary to acquire or develop advanced navigation-attack systems that would allow aircraft to lethally attack ground targets from altitudes above the effective range of unsuppressible fire from short-range anti-aircraft and man-portable, surface-to-air missile systems. Fourth, precision guided munitions are required to attack small fortified point targets like hangars. Fifth, air forces must be capable of 24-hour operations. Sixth, an air force must be allowed to conduct an anti-air operation prior to its full commitment to the ground battle.

By the early 1980s, adequate technotactical responses were at hand that fully reestablished, at least temporarily, the preeminence of the tank and aircraft. As the IDF marched into Lebanon in 1982, its forces—including the IAF—were perhaps the most modern ever fielded by any country up until then; yet, results did not altogether match expectations. Using American-built airborne warning and control system (AWACS) aircraft to direct high-performance fighters, the IAF totally outclassed the Syrian air force and was able to bring down 100 of its planes without suffering a single loss in air-to-air combat. Its performance on the air-to-ground mission was equally impressive since Syria's entire Soviet-supplied surface-to-air defense system was knocked out within a few hours against the loss of only one IAF aircraft. Enjoying total command of the air, the IAF should have been able to make mincemeat of its opponents; yet, by and large, this was not what happened.

As it turned out, the closed, mountainous, partly built-up and cultivated Lebanese terrain was much less conducive to air-to-ground operations than the open Sinai Desert (or, incidentally, the totally flat terrain in and around Kuwait). This helps account for the fact that the Syrian ground forces, though defeated, were able to withdraw in good order and to live to see their commander decorated for his accomplishment. Next on the list of IAF's shortcomings was a dangerous tendency towards fratricide. Although air-to-ground communications were probably as good as was technically feasible, this did not prevent a heavy air attack on one of the IDF's own units. For the rest of the campaign, these units draped themselves in conspicuous red cloth, proof enough that they feared their own air force more than that of the enemy. Finally, the opponent in this campaign consisted largely of guerrillas belonging to the Palestinian Liberation Organization and, later on, a host of other organizations. These forces possessed neither clear troop concentrations that could be destroyed nor lines of communications that could be interdicted. Against them, the operations of the IAF (and much of those of the ground forces as well) proved to be almost totally irrelevant.

Today's official Israeli military doctrine remains committed to the concepts of maneuver warfare—once again because it hopefully enables wars to be concluded quickly at low cost. But is it still feasible for Israel to execute maneuver warfare? Until recently, Israel was deterred from launching surprise or preemptive attack by its dependence on American support to offset the Soviet threat. Today the Soviet threat to Israel may have evaporated, but Israeli dependence on American financial and political support has not. Therefore, Israeli military options remain limited by America's strategic reliance on cheap, accessible Middle Eastern oil and by American links to the large and diverse Moslem world. Unless it should see its very existence threatened—a situation made highly unlikely by the nuclear deterrent that it possesses—Israel cannot launch a preemptive attack without having at least the

passive support of the US government, influenced by US public opinion.

On the operational level, Israel's primary military adversary is Syria. But the Syrian military has grown in size to such a degree that the Damascus-to-Golan region is now the most heavily defended area anywhere in the world. So long as Israel is engaged in a war with Syria, it will have to make difficult breaching attacks through this fortified area. Consequently, the IDF's ground forces have been uniquely trained and equipped to conduct breaching operations of fortified zones.

Israel has attempted to acquire decisively superior technology and to generate the high-quality forces necessary to ensure that such breaching attacks can be successfully prosecuted. But the IDF fully recognizes that the cost of any such attacks will inevitably be high even assuming there will be effective IAF participation. Time and again, it has found during maneuvers how difficult it is to sustain a high tempo of operations when advancing through prepared fortified areas. Moreover, the very closeness of Damascus to the front will limit the IDF's maneuver and exploitation options if and when the breakthrough is accomplished. Under these circumstances, Israel will have to pay a severe price without achieving an adequate benefit.

From a purely military viewpoint, the logical alternative to costly frontal attacks would be broad flanking operations around the Golan zone launched through the Bekaa Valley of Lebanon or a thrust through less defended territory in northern Jordan. However, neither alternative may be politically feasible.

Hence, in Israel there are some who suggest that the IDF combine the strategic offensive with the tactical defensive, using air power alone to devastate Syria, while IDF ground troops statically hold the Golan frontier. This is a viable, minimal-risk approach, but one at odds with the aggressive leaders of the Israeli armored units who, until very recently, still dominated the General Staff. These officers regard it as

most likely that any future campaign will take place between Israel and some larger coalition of Arab states, as was the case in both 1967 and 1973.³⁵ Such a coalition would enable the IDF to launch broad enveloping attacks of the Golan region.

In the longer term, nevertheless, the armor-heavy IDF is being transformed. All available evidence suggests that the Israeli General Staff recognizes that the roles and missions currently assigned combat arms is being impacted by rapid advances in technology, such as hypervelocity guns and long-range, indirect-fire, top-attack, antivehicle missiles.³⁶ Consequently, in the conventional battlefield fighting system that currently dominates the IDF, the traditional components of maneuver warfare—armored mobile combined-arms team supported by fighter/attack aircraft—may soon be no longer viable. This has already had a profound impact on IDF force and investment planning for the 1990s. In the longer term, it will continue to impact future Israeli force structures and national defense strategies.

Notes

1. Kenneth S. Brower, "The Economic Implications of Military Doctrine and Weapons Decisions," in Royal Military Academy, *Gorbachev, Economics and Defence* (Sandhurst, England: Soviet Studies Research Centre, 1987), chap. 4.

2. Yigael Yadin, "For by Wise Counsel Thou Shalt Make Thy War: A Strategical Analysis of Last Year's Battles," appendix 2 to B. H. Liddell Hart, *Strategy* (New York: Praeger, 1954), 386–404.

3. Ariel Sharon, *Warrior: The Autobiography of Ariel Sharon*: (New York: Simon and Schuster, 1989), 119; and M. Illan, "The Use of Surprise in the Sinai Campaign" *Maarachot* (Hebrew), October 1966, 23–7. Both these writers emphasize that individually the Arab soldiers fought well; therefore, the key to defeating them consisted of throwing them off balance by moving rapidly and doing the unexpected.

4. Yehuda Weinraub, "The Israeli Air Force and the Air Land Battle" *IDF Journal* 3 (1986): 25.

5. On the planning process, see Martin van Creveld, *Command in War* (Cambridge, Mass.: Harvard University Press, 1985), 200–201.

6. For the details of the air forces on both sides as well as the air strike itself, see Edward N. Luttwak and Daniel Horowitz, *The Israeli*

Army (New York: Praeger, 1975), 222, 226–31; and also Robert Jackson, *The Israeli Air Force Story* (London: Stacey, 1970), 176ff., 185–96.

7. M. J. Armitage and R. A. Mason, *Airpower in the Nuclear Age, 1945–84: Theory and Practice* (New York: Macmillan, 1985), 114–23.

8. Moshe Dayan, *Story of My Life* (Boston, Mass.: William Morrow, 1976), 350–54.

9. See M. Bar-On, ed., *Israel Defense Force in the Six Day War* (Tel Aviv: Ministry of Defense, 1968), 38, for an explanation of the Israeli view of mission-type orders as formulated by General Tal.

10. During this battle, General Tal lost control over his brigades, one of which got lost in the dunes. See B. Amidror, “The Race for El Arish,” *Haolam Hazeh* (Hebrew), 26 February 1975, 18–9.

11. For the approach to Abu Ageila, see Sharon, 179–204; and also the account in Yael Dayan, *Israel Journal, June 1967* (New York: McGraw-Hill, 1967), 37ff. Miss Dayan at that time was attached to Sharon’s headquarters.

12. See the account of the helicopter squadron commander in Lon O. Norden, *Fighters over Israel: The Story of the Israeli’s Air Force from the War of Independence to the Bekaa Valley* (New York: Orion Books, 1990) 74–75.

13. Jackson, 180–81.

14. *Ibid.*, 196–97.

15. Norden, 78–79.

16. Steven J. Zaloga, *Armor in the Middle East Wars, 1948–1973* (London: Asprey Publishing Ltd., 1981), 21.

17. Generally speaking, the lethality of aircraft using conventional high-explosive iron bombs against ground targets is a linear function of the weight of bombs dropped and an inverse square function of the accuracy of the average miss distance of each bomb. Therefore, a new attack aircraft carrying twice the bomb weight of the aircraft it replaces would be twice as lethal. If the new attack aircraft is also equipped with avionics that provide three times the accuracy, it becomes 18 times as lethal. The overall lethality of an air force may be determined non-dimensionally by multiplying the disposable payload weight of each aircraft by the number of attack sorties generated daily by each aircraft and by the square of its air-to-ground accuracy, divided by some baseline number.

18. See Michael I. Handel, *Israel’s Military-Political Doctrine* (Cambridge, Mass.: Center for International Affairs, Harvard University, 1973), for the details.

19. H. Bartov, *Dado: 48 Years and 20 Days* (Hebrew) (Tel Aviv: Ma’ariv Book Guild, 1981), 273–90.

20. Abraham Adan, *On the Banks of the Suez: An Israeli General's Personal Account of the Yom Kippur War* (London: Arms and Armor Press, 1980), 42–59.
21. Saad Shazli, *The Crossing of the Suez* (San Francisco: Presidio Press, 1980), 221–32.
22. Adan, 16–34; and Trevor N. Dupuy, *Elusive Victory: the Arab-Israeli Wars, 1947–1974* (New York: Harper and Row, 1978) 411–21.
23. Adan, 89ff.
24. Muhammed Haykal, *The Road to Ramadan* (London: Collins, 1975), 215.
25. Shazli, 166ff.
26. Adan, 285.
27. Sharon, 313.
28. Shazli, *Crossing of the Suez*, 253–65.
29. Norden, 146.
30. By international standards, the IAF's overall availability rate of 85 percent on 6 October 1973 was unusually high. Most NATO air forces have overall availability rates of less than 50 percent, primarily because they only deploy about two-thirds of their aircraft in operational squadrons and only about 75 percent of these are generally available for service. At the start of the October war, about 105 Phantoms, 185 Skyhawks, 75 Neshers and Mirages, 25 Super Mysteres, 30 Ouragans, and 80 Fougas were active in service. The Ouragans and Fougas were not used in combat during the 1973 war. They probably would have been deployed if Jordan had entered the war because it had a far less capable air defense system than Egypt or Syria.
31. Various sources quote different loss ratios. Norden claims 277 Arab versus 11 IAF air-to-air losses. D. Pawloski, "Changes in Threat: Air Combat Doctrine and Force Structure" (General Dynamics, February 1992), claims 442 Arab kills versus 65 IAF losses. In either case, the IAF scored overwhelming air-to-air victories.
32. "The War in the Air," *Defense Update International*, no. 42 (1983): 16–23. One reason they were ineffective was that the IAF, instead of attacking the Egyptian truck convoys massed for the invasion with cluster-type munitions, went for the bridges across the canal; those, however, proved very hard to kill without the guided munitions that, for security reasons, could not be effectively used during the opening days.
33. There are three major reasons why average sortie rate for fighter and attack aircraft during the 1973 war was only about 50 percent of that achieved in 1967. First, in 1967 the IAF had three weeks to prepare for war, whereas in 1973 it was caught by surprise. Second, the number of aircraft returning damaged was higher in 1973. Third, the F-4 Phantoms that formed the mainstay of the IAF in 1973 were notoriously unreliable and maintenance-demanding aircraft.

34. Ibid., 324ff.

35. For one Arab's vision of such a coalition, see Saad Shazli, *The Arab Military Option* (San Fernando, Calif.: American Mideast Publishing, 1986), 186ff.

36. The most detailed analysis of these technological developments and their impact on the Middle Eastern battlefield is in S. Gordon, "Technology, Doctrine and Israeli Military Power" (Hebrew) (PhD dissertation submitted to the Hebrew University, Jerusalem, 1992).

Chapter 6

Maneuver Warfare and Air Power in the 1990s

Doctrinal, situational, and technological conditions that have long restrained air power's potential are changing. The technology of air attack has temporarily gained the upper hand over the technology of air defense. In Europe, and for most contingencies, wide spaces will generally separate the forces of protagonists initially, providing time for air power to demonstrate its potential for deterring and stopping aggression before it is itself pressured by events to protect, support, and interact with defending ground forces. Last but not least, the US military has belatedly adopted a maneuver style of war.

Past Limitations on Air Power

In World War II, air power came into its own at sea, but ground-oriented tactical air forces did not have as great an impact. Aircraft had limited range and payloads, equipment was whimsical and not always reliable, and delivery accuracy was erratic. Although the Soviets had the least capable aircraft, provided the least support, and imitated the air tactics of others, they nevertheless obtained the most *operational* leverage for their effort. The reason for this paradox is apparent from chapter 4. Soviet air was integrated into ground operations as if, like tanks and artillery, it was merely one of several combined arms. Its purpose was not to fight "like" with "like" but to bring out an enemy weakness that another Soviet arm could exploit. Also, their air was concentrated and deployed principally for and along focal efforts. Sorties were generated for military effectiveness at the operational *Schwerpunkt*, not for efficiency in the generation of sorties or even in the maximizing of the

quantities of ordnance dropped. And given the way that aircraft numbers were deployed along focal efforts, the concept of close air support was “macro” in nature; that is, it facilitated breakthroughs and exploitations. Destruction of specific “micro” targets was the task of massed artillery and direct-fire artillery guns organic to frontal units (instead of howitzers).

During World War II, fighter/attack aircraft generally had limited range and payload. Bomb delivery accuracy either required dive bombing or flying in low and close. Dive bombers were especially vulnerable to enemy fighters and to anti-aircraft artillery fire because of their predictable flight paths, while low-altitude operations increased vulnerability to light-calibre AAA fire. Furthermore, World War II tactical aircraft could only operate in clear weather. They were most effective when strafing, but their guns had limited range and limited lethality against all but soft targets. Standoff range could be increased by using air-to-ground rockets, but these were very inaccurate.

The German Luftwaffe was particularly effective in the period of 1939–1941, in part because of its psychological impact on unprepared enemy forces and in part because of the paucity of resistance. However, subsequent analysis has shown that the bark of German aircraft was often worse than their bite. The Ju-87 Stuka dive bomber was initially effective because of its ability to deliver ordnance on target and because of the lack of opposing fighters and air defense. This effectiveness proved short-lived. By the end of 1940, the relevant squadrons had to be taken away from the Battle of Britain and consigned to the less-demanding environment of the eastern front. Even there, the Stuka’s most important role from 1942 on was that of low-level, tank-hunting missions conducted with the aid of cannon, not bombs. By the end of the war in Europe, none of the antagonists used dive bombers widely.

For doctrinal reasons, both the Germans and Soviets recognized the need for air power suitable for the *operational*

role as opposed to the tactical/strategic one. But the technology available met the requirement only to a limited extent. Until very late in the war, single-engined fighter-bombers generally lacked the range or payload to execute the mission. Twin-engined light bombers lacked the air-to-ground accuracy to be used effectively unless they operated at low altitude. But at low altitude, they were vulnerable to enemy fighters and AAA fire. The requirement for accuracy explains why all German bombers had to be able to dive bomb. Without dive bombing, they were ineffective as hard-kill systems for use in operational-level warfare.

World War II proved that under certain circumstances the movement of enemy forces could be delayed by attacks on transportation modes such as rail yards and bridges. In the west, the United States and Great Britain allocated massive air power resources to this problem, but since they did not coordinate these attacks with maneuver on the ground, the effects were generally limited. In the east, where air was more keyed to ground operations, interdiction received less emphasis and its payoffs were equally meager except at key river crossings over difficult barriers. Interdiction was countered by moving at night and in bad weather. In the east, daylight movement of soft, vulnerable convoys was common, but in the west such movements were impossible in the face of continuous Allied air attacks.

After World War II, when the jet turbine replaced the propeller, both the thrust-to-weight ratio of aircraft and the absolute propulsion power available increased. At first, the high specific fuel consumption of the jet turbine tended to offset these advantages, but ultimately this too improved. By the mid-1960s, the weight of tactical aircraft had increased fivefold. The range and payload of these aircraft had dramatically improved. But the problem of air-to-ground accuracy and all-weather operation remained; indeed, it may be said to have worsened, given that most jet-propelled aircraft were both much faster and considerably less maneuverable than their predecessors.

In the 1960s and 1970s, the balance between air defense and air attack varied as surface-to-air missile systems and radar-guided AAA weapons were deployed and counter-measures and tactics developed to neutralize them. Around 1970, the digital computer, modern avionics, and precision guided munitions "solved" the air-to-ground accuracy issue for aircraft. In the 1980s, synthetic aperture radars, forward looking infrared radar (FLIR), and other technologies transformed the tactical aircraft into a 24-hour fighting machine. As was evidenced in the Bekaa Valley in 1982 and Kuwait in 1991, the ground-based integrated air defense system appeared to be neutralizable because of its dependence on active radar emitters that could be jammed, deceived, suppressed, or killed. But numerous optically controlled AAA gun mounts and light man-portable and medium mobile SAMs could not be fully suppressed. To survive, aircraft had to stay high. In static conditions and clear weather, air power could still find targets from an altitude of 20,000 feet. In Europe and much of the rest of the world, such conditions do not pertain. In Europe, war would be too dynamic, armies would operate against a cluttered background, and weather conditions would be generally poor. In low-intensity conflict, conditions may not be dynamic, but the environment is exceedingly complicated and situations are often ambiguous.

These reasons, as well as the problem of friendly fire, caused the Israeli Air Force to give up the CAS/BAI role. That role has now been transferred to attack helicopters and new-model rocket artillery. Air power will be used operationally against clearly definable target sets in the rear. Will other air forces do the same?

Air Power and New Developments

So far as large-scale conventional war is concerned, air power for the next decade will shine in ways it has not done before. In the last decade, new technologies have given air a

jump over its ground opponents. The Israelis demonstrated this in 1982, but Western air forces were unable to do so because of the shackles imposed by the overall NATO military context. These shackles have now been removed. Should there be another war in Europe, the opposing forces will initially be separated and air forces will no longer be tied to supporting statically arrayed ground formations. As a result, the room for maneuver will be much larger.

Fighter aircraft will, of course, not reign supreme forever. No system does. But air almost assuredly will dominate throughout the 1990s and into the next century. Indeed, air—now benefiting from being at the top of a cyclical oscillation between air and air defense—profits from the current slowdown in research and development and the deployment (and testing) of new systems. To be sure, other technologies are waiting in the wings. One is hypervelocity small cannon gunnery that will at least double the effective range of optically controlled air defense guns that are difficult to suppress. Thus, there will be a need for longer standoff ranges for aircraft needing to bear in so as to acquire tanks against the cluttered background that characterizes land warfare except in deserts.

On the other hand, some military thinkers assert that a tactical discontinuity on the battlefield is imminent. Influential German, Israeli, and Russian military schools argue that light infantry operating entirely within close terrain but equipped with precision indirect-fire weapons and having access to rapidly delivered mine fields and barrage fires can dominate adjacent open terrain without being vulnerable to enemy tanks. Should this assertion prove true, then air forces can shift their focus from hard point targets to various categories of soft targets (air defense, infantry, artillery, engineers, and logistical units).

Hardware

War-fighting systems—the tank, the fighter, the battleship, and the aircraft carrier—all have life cycles marked by a

continuous contest with various counters. Sometimes these gain the upper hand over a system, only to be recountered with the particular system regaining dominance. Tactical air power has witnessed large oscillations in the contest of relative effectiveness. In the various Arab-Israeli wars, offensive air power played a pivotal role in collapsing the Egyptian army in 1967, was virtually neutralized in 1973, and rendered enemy air defenses impotent in the Bekaa Valley in 1982. In the 1991 Persian Gulf War, offensive air power was dominant against air defenses and ground targets, but the record is clouded by the opposing side's passiveness and seeming unfamiliarity with countermeasures.

Tactical aviation's increased effectiveness in the 1980s was due to two groups of technologies: day-night, all-weather accuracy of air-to-ground ordnance and the attacker's ability to suppress radar. Still, it can be argued that these changes—important as they are—would not have yielded militarily significant benefits in a war like Vietnam (or, to select a current example, Yugoslavia) and were not yielding comparable benefits on the NATO central front. Right up to the very time that the Berlin Wall collapsed and the Soviets agreed to asymmetrical reductions, NATO had been under great military pressure and was believed to be militarily inferior by most students of the military balance.

Situational

Air power's potential could not be converted into military advantage on the NATO central front. Most obviously, the Warsaw Pact fielded a strong opposing air force and even more formidable ground-to-air defenses. Equally daunting were the military weaknesses imposed by NATO's military strategy—the NATO layer cake. National forces were employed in a linear, cordon defense. Such a defense may have strategically strengthened nuclear deterrence, but operationally it was the weakest form of conventional defense. Since most divisions were on-line and reserves were small, thrusting penetrations by Soviet armored spearheads

and operational maneuver groups (OMG) could collapse the entire NATO front.

Any collapse implied that air forces would soon lose their bases. Alliance military doctrine, especially stressed in the American corps sectors, also mandated air forces to support forward forces in a way air forces were not well suited for: to be used all along the front against enemy penetrations in which friendly and enemy forces were interspersed. There was little time for logistics interdiction, which would have limited effect anyway because of the vast amount of stores already accumulated forward, the relatively limited need for logistical support after a penetration, and the telescoping of time with the collapsing defense lacking reserves to mount serious counterattacks.

All the above conditions no longer exist. Ground forces are in balance, the cordon has been replaced by counter-concentration, and wider spacing now precludes meaningful surprise. In the air, there is a special imbalance favoring the US Air Force. For many years, there is unlikely to be any opponent with strong opposing air forces and air defenses. Also, few countries possess the technology to counter the USAF's suppression and targeting technologies. The air forces of the former Soviet Union could conceivably appear once again. Even so, they will no longer be forward located.

Henceforth, a spacing of many hundreds of kilometers must be crossed (a cordon sanitaire) before NATO and the German border can be attacked from the east. This spacing phenomenon will often exist in other areas of potential conflict as well, especially in the Middle East. For example, such spacing (plus minimal ground forces) is one method by which Saudi Arabia could have been defended in the early phases of the Gulf conflict, and it is a method the US military could have used to strategically turn Iraqi forces in Kuwait while actually avoiding combat. Such spacings automatically change the nature of air power from tactical to operational, and sometimes to strategic.

Also, the US Air Force is unlikely to be constrained by the dictates of linear, attrition warfare, with the possible exception being in Korea. This constraint was partly an accident of history. American deployments in both world wars in Europe, in the island-hopping campaign in the Pacific, and again in Korea were characterized by high force-to-space ratios as well as tied-in flanks. This led to linear warfare, in which the principal weapon is firepower. Elsewhere in the world, the rule has been to "pin and flank," or, more simply, to seek and exploit gaps in the array of opposing forces. This is a nonlinear version of war in which the principal weapon is the tactic of maneuver.

The Cordon Sanitaire of Reconstruction

The former USSR could perhaps conceivably reform and renege on aspects of its arms agreements and demand larger compensatory payments from Germany and the West or even reconstitute large and threatening military forces. However, the principal features of many recent developments are irreversible: the Warsaw Pact has collapsed, Soviet equipment levels are down sharply, and Soviet troops are unlikely to remain in Germany and Eastern Europe after 1994. Forward defense of Germany and NATO now begins on the Oder/Neisse rivers. Small US, British, and other multinational air and ground units will remain in Germany, but none will relocate in peacetime farther east. A large space will be permanently opened between the forces of East and West. Poland, Czechoslovakia, and Hungary have declared a condition of armed neutrality. Their lands have become a de facto cordon sanitaire between the former Soviet and Western forces.

Wherever there is spacing, surprise attacks by conventional means are virtually ruled out. Distances are too great for surprise air attacks to be remunerative, while surprise ground attacks are virtually impossible to mount; ground attacks also now require moving forces 500 kilometers forward and repositioning vast stores. This process requires

time (from a few weeks as in the 1945 Vistula-Oder campaign to what will involve months, according to the intelligence community's lengthier estimates) and what in the interim would provide a "target-rich environment." Obviously, this implies increased opportunity and importance of air forces and follow-on forces attack (FOFA).

The original formulation of FOFA was in itself somewhat dubious because of the great demands it made upon technology and because the USSR's best troops and largest stocks were already well forward. However effective FOFA targeting might be, its efforts would be for naught if enemy forces and supplies already forward had been sufficient to collapse NATO's defenses at the first shock. (This was the German argument to the FOFA concept, drawn from their experience which had brought them early victories in World War II.) Ultimately, the FOFA technology was complicated because its focus was upon targeting tanks (i.e., moving hard points) with large missiles while they were still several hundred kilometers from the front lines.¹

By 1994, forces and stocks of the former Soviet Union will all be withdrawn. In the presence of a cordon sanitaire and wide separation of forces, FOFA becomes interdiction of first forward echelons (IFFE). Its value becomes high for the following reasons:

1. Whereas interdiction of second echelons and stock replacements might or might not buy time and disruption, interdiction of returning first elements and their accompanying supplies surely does. Given NATO's new organizing principle of reconstitution to generate forces as world conditions deteriorate, time can be important for activating, mobilizing, and deploying forces.

2. Once forward supply depots are emptied, refilling them is demanding and time consuming. Without them, it is difficult for modern armored armies to project themselves. Modern tank armies only appear mobile. The fact is that they have fallen into the same pitfall as the overweight knights of the fourteenth century as they have sought

protection against technical advances in penetrating weapons by ever-better and heavier armor to the point of immobility.² Furthermore, their logistical demands are so large that they have become tethered and tied to their umbilical cords, as was recently demonstrated by the US VII Corps in Iraq. Ensuring that there is fuel for supporting fast-breaking operations is easier said than done given the scale of demand. Moreover, disrupting any chain under stress—fuel or ammunition—soon slows and even halts the operation.

3. A cordon sanitaire implies that en route ground-based air defenses will be weak. This makes air-delivered ordnance more attractive than missile delivery (which is more or less proscribed anyway by the spirit of the Intermediate-range Nuclear Force [INF] Treaty). The attacker's response, since he can hardly allow his advancing first echelon to be attacked with impunity, is to deploy ground or air-based air defense along his transit corridors. If cordon countries retain a resilient defense, the attacker's attempts to secure his own air defense weapons could tie up substantial numbers of invaders. Since these would likely be deployed early—and from standing forces (if any type of early warning advantage were to be gained)—the indirect (virtual attrition) benefits of IFFE would be as large as the direct benefits of interdiction. Standoff air weapons increase this “troop absorption” effect by requiring the attack to secure even larger areas so that air defense firing units can be located therein.

4. IFFE is a quick-reaction method of assisting a cordon country threatened by invasion or occupation. As such, it is a crisis management tool and enhances deterrence, although its effectiveness is less than direct targeting of the aggressor's own territory.

5. Finally, if the tank does indeed lose its preeminence on the battlefield and its status as the principal threat to frontline defenders, then tanks no longer need be the focus of interdiction. Rather, it becomes more important for air power to strip away the soft elements composing the

combined arms team. This drastically eases air-to-ground targeting and ordnance demands. The effectiveness of air power is correspondingly enhanced.

It is expected that these five reasons will significantly enhance the importance of air power in any future defense of Europe. They do not require departing from accepted practices, but they do require changes in priorities and resource allocation.

Clearly, the demands that maneuver warfare makes upon air power are different from those made on it by static warfare. Valued in both styles of warfare, of course, are the essential characteristics of air power such as its ability to mass and move large distances, the speed with which it can be brought to bear, and its firepower. Maneuver warfare particularly values air's ability to concentrate at focal efforts and to interact with the ground arms so as to promote one's own maneuver while slowing the opponent's reaction time—two features missing from static, attrition warfare. The objective is to orchestrate air's attributes to best accomplish the *theater* commander's mission. To achieve this goal, the usual system of mutual updating by means of situation reports, liaison officers, and occasional contacts conducted by wire or other technical means may not be good enough. Often only face-to-face meetings between the ground and air commanders will serve the purpose, and indeed both sides will do well to take this need into account when determining the sites of their respective headquarters and the ways in which they function.

Differences in Styles of War for Air Power

The first difference between the styles of warfare is the dynamics of time. In static warfare, timing is important; in maneuver warfare, it is critical. Static warfare allows protracted planning. In high-tempo maneuver, protracted planning is often overtaken by events. Fighter pilots recognize that the essence of air combat is described by Boyd's OODA loop with its implementing technique of

energy maneuverability. Maneuver requires generalizing this approach to overall air operations so as to affect events on the ground in a *timely* manner. Many opportunities are fleeting. When tempo is critical for the ground element, so too must it be for the air portion interacting with ground forces.

A second difference between the two styles of warfare is the *Schwerpunkt* concept and sortie generation, which is derived from it. In static warfare, targets are virtually infinite in number and undifferentiated as to their importance. Accordingly, the measure of merit is the maximizing of kills in a target-rich setting. Therefore, generating maximum sorties and allocating them daily according to availability becomes the air commander's task.

In maneuver warfare, a "target-rich" environment is not a relevant criterion for the use of air power. The important criteria that must govern the use of air power are focus of effort and surge rates. Applications of air power in other areas and times are of no particular importance. Allocation of sorties by availability may even undercut the overall military effort by lowering the number of sorties that can be surged at "the right time and right place." The measure of merit is no longer the number of enemy killed and vehicles destroyed but *operational* results obtained by all force elements synergistically combined. A condition of maximum kills is obtained by efficient allocation of sorties, whereas "results obtained" seeks military effectiveness. Thus, efficiency and effectiveness are *not* synonymous in attrition and maneuver warfare. For example, 100 tanks killed in secondary areas may be less important than an air offensive that merely delays the juncture of two units so each can be defeated in detail.

A corollary proposition is the allocation of missions among tasks. Air commanders who are acting within the framework of maneuver warfare must avoid the temptation of having like fight like and giving the air battle priority over the ground battle. Putting air superiority first makes eminent sense if forces are initially separated or if there is a

protracted war in which time is not so critical, as was largely the case in Iraq. However, the concept makes no sense if in the interim air bases have been overrun and occupied and the coalition has collapsed. For instance, effecting events on the ground by sortie suppression was the real logic behind runway cratering in the early stages of a NATO conflict. Conversely, if there is no ongoing ground war and if enemy aircraft are well hidden or sheltered, it is sometimes best to flush out enemy aircraft so they can be destroyed early in the conflict. Measuring air power's success by sorties flown or by its own loss rates is to use input measures that may or may not have much relation to the real outcome of the overall battle.

A third difference between the two styles is that in maneuver warfare the air arm is truly part of the air-land combat arms team. The question that commanders should ask themselves is, What can air do that no *other* arm can do that will have a *decisive* effect on the outcome of the ground battle?³ What is unique about air power other than its descriptive attributes of speed, range, and heavy load-carrying capacity? If there are none, then air power's role as a large and expensive organizational entity is relegated to the life span of an endangered species.

In static, linear-oriented war, air power's roles are no longer unique. In this form of warfare, air power's principal roles in Europe would be reduced to obtaining and maintaining air superiority over another air force, itself of reduced importance, as well as to carrying out shared tasks with other arms in which air has no particular advantage to justify its own high costs. Against an opponent with strong ground and air defenses, air forces will find CAS and BAI difficult, while static warfare implies a prehostilities buildup that reduces the potential for supply interdiction. Even when opposing air defenses are weak, air has more difficulty than its army competitors in staying abreast of the land battle and in acquiring clearly defined ground targets—to say nothing of the problem of friendly

fire, which can make air power as dangerous to one's own side as it is to the enemy.

Maneuver warfare, by contrast, offers air power new vistas. In terms of combined arms symbiosis, ground forces compel enemy ground forces into reactive movements. As a result, it is not necessary for friendly air to achieve many kills; all it must do is to slow down the enemy's tempo of operations (by attrition, disruption, and prevention of timely movements and junctures of units) so that friendly ground forces can pin, envelop, and break up opposing forces.

Maneuver downgrades two of tactical air power's traditional missions—CAS and close BAI—but endows it with an additional ground-shared mission and two unique missions. It shares a mission with tube artillery, multiple launch rocket systems (MLRS), and attack helicopters by providing immediate on-call fire support for the lead elements of the forward-thrusting spearheads. The two unique missions are (1) to protect the flanks of thrust-line forces from blindsiding counterstrokes, and (2) to protect against wide, circling envelopments from remote routes. Ground forces could perform these missions by positioning forces everywhere, but the resource cost would be considerable. Only air power can screen and bring concentrated firepower rapidly and accurately to bear.

In positional warfare, logistics interdiction, while rarely successful except in special situations, held a certain appeal because of the vast amount of supplies consumed by linear-arrayed armies firing vast amounts of artillery and laying extraordinary tonnages of mines. In maneuver warfare, logistic strangleholds imposed by enveloping ground forces (and by sea) are often decisive. By contrast, interdiction by air rarely has been decisive. The general reasons are in the great logistic support that such warfare requires, as well as in the costs and difficulties involved by day and the great possibilities of road repair and circumvention by night.

In the past, swarms of strafing and dive-bombing aircraft were required to hit inexpensive trucks that were laden with

cheap commodities and protected by opposing fighters and ground air defenses. Rail lines were more remunerative targets but they tended to fall outside the range of contemporary German and Soviet fighters, while bombers that had the range were extraordinarily inaccurate and required fighter escorts. Period aircraft also had the problem of being too short-legged to support fast-breaking maneuver. In the defense, air bases were often overrun, while in the offense spearheads outran the ability to rebase aircraft. Today's aircraft have fewer limitations and fewer are required, but the rest of the equation remains. Besides, today's aircraft have become hyperexpensive and hence relatively few in number.

Furthermore, the notion held by many that air could impose logistic strangleholds comparable to those imposed by ground forces contained a major logic flaw. Strategic turning movements whereby ground forces maneuvered to impose themselves across the defender's lines of communications often were effective not so much because supply lines had been cut by previous air attacks but because the defender was dislocated and had to attack in the wrong direction and under unfavorable circumstances. Air interdiction lacks an important characteristic: it can destroy, but it cannot envelop.

This is not to say that logistics interdiction by air does not have its place in special situations. For the defender, this situation occurs when an attacker has overextended himself, has nearly exhausted his accompanying supplies, and is hit by a counterattack. The subsequent exhaustion of his supplies and his inability to respond by fire or movement leads to his destruction. For an attacker, it occurs because defending units will almost always have accumulated stocks nearby. For logistics interdiction to be effective, the defender's consumption rate has to exceed the logistics inflow for a substantial period—which implies attrition, not maneuver, warfare. Thus, achieving this result can be very costly; the maneuver style of war seeks to avoid such costs.

Conceptualizing maneuver as we have done in this book is one thing. Carrying it out is much more difficult. Against a sluggish and passive opponent, maneuver can be applied in cookbook fashion. Against an equally adept and agile opponent, it requires art of a very high order. History can illustrate and provide a multitude of ideas. The difficulty lies in application.

Armies that lack tempo and facility in coordinating arms should limit themselves to static warfare with its stress on firepower and attrition. Since the days of Croesus's campaign against Cyrus the Great, attempts at maneuver by sluggish armies against agile foes have ended in failure. Sluggish maneuver creates vulnerabilities for the agile to opportunistically exploit. This is perhaps the main reason why armies historically have tended to eschew maneuver for the "safe," prosaic frontal assault. That was much of Gen U. S. Grant's great insight and led to his prescription for victory in the American Civil War; General Lee never got a chance to outmaneuver him.

In general, armies deficient in maneuver qualities should avoid maneuvering against opponents strong in these attributes. Deficient armies should seek their safety with tied-in flanks, fortifications, and difficult obstacles to their front, flanks, and rear. This was the formula of the Egyptians in the 1973 Arab-Israeli War until they felt compelled to shift to the offensive in order to relieve pressure on the Syrians in the Golan. In spatial areas where flanks cannot be locked in, static armies are at a severe disadvantage unless they can induce the maneuvering army into costly assaults, whether from front or rear. Stalingrad and Kursk illustrate this phenomenon.

In the annals of war, contests between equally agile opponents are rare. The wars of the Diadochi (Alexander's successors) and of the Italian Condottiere in the fifteenth century are the exception. These generals may have lacked originality, but what they did was to conduct war like chess masters. Most generals in history have not been so skilled.

Indeed, while there were exceptions (as in the case of the Byzantines), military schooling and the systematic study of war at any level above the tactical is itself largely a post-Napoleonic phenomenon.⁴ Jomini and von Clausewitz were among the first to verbalize and conceptualize the art of war.

Presenting an additional obstacle to study, the great classics that form the body of the study of military history and the Great Captains have almost invariably been one-sided. A great victory like Cannae takes both a Hannibal and a Varro (Gaius Terentius Varro, the Roman commander). Nevertheless, like the well-known quip about the systems analyst who lost his car keys in the dark alley but searches for them under the lamp post because that is the only light, we are drawn to the classics in illustrating the actual unfolding of maneuver and of the ways air power might fit into this scheme.

As has been emphasized throughout this study, the maneuver strategist attempts to win with minimum combat. On the offense, he seeks to deceive the enemy concerning the true location of the attack, as the Germans did in 1940. He may try to bring the enemy to a situation where his forces are overextended, as the Iraqi forces were on the eve of Gen Norman Schwarzkopf's "Hail Mary" maneuver. He may also attack the enemy at a point (or points) that is both critically important and weakly held, as the Soviets did during the Stalingrad campaign. He perhaps could surge using narrowly concentrated and massive firepower to paralyze enemy resistance long enough for his penetration to occur (Sharon at Abu Ageila in 1967). He may also try to outflank the enemy or create artificial flanks by deep thrusts into his vitals (the 1939 German campaign in Poland). Finally, our strategist could disrupt enemy cohesion and break him up into separate parts, each of which can then be overwhelmed in turn.

The above options are admittedly schematic. Still, their constituent parts can fit into almost any example of

operational-scale maneuver, offensive or defensive. (The chief difference between offense and defense consists of the fact that, in the latter, the enemy attack may actually help one's own maneuver by driving deeper and deeper into the sack that defending forces have prepared for him.) Taking the scheme offered by the above options as our starting point on which all actual cases are merely variations, air power can play the following roles in offensive maneuver:

1. As was the case in the Ardennes in 1940 and during the first day of the 1967 campaign, it provides air cover and thereby assists in gaining surprise and maintaining security.

2. As was the case on the river Bzura in Poland in 1939, it is a swing force capable of assisting a weak pinning force should the need arise.

3. As was the case during the fighting around Kiev in 1941, it helps seal the pocket or pockets created by the ground forces.

4. As was the case during the race to the sea in 1940, should the defender attempt to counterattack, then spacing provides a minicordon sanitaire in which to attack moving, and therefore exposed, ground formations.

5. As was the case during the same campaign, when the opposing counterattack closes, air reduces its tempo and helps set up a counter-counterattack.

6. Finally, during the deep penetration and turning movement, air provides supporting firepower against selected points, either killing the defenders or forcing them to keep their heads down until artillery can deploy.

In addition, when used in a defensive-maneuver campaign, air power can utilize its unique characteristics of speed and concentration to play the following roles:

1. As was the case of the Germans in the Netherlands in 1940, it may be used to induce further movement into the sack by an otherwise inappropriate allocation to CAS so as to draw the enemy's attention away from the main front.

2. If, as happened on the Golan Heights in 1973, the bottom of the sack threatens to collapse, air must devote top priority to shoring it up.

3. When the counterattack opens, air support is needed for a quick start.

4. Air must be ever alert to the possibility that the attacker is attempting to move around the shoulders of the sack to envelop the defense as a whole.

5. Even as the attacker's effectiveness collapses, air in conjunction with artillery must administer a coup de grace so as to preclude the enemy from mounting rescue operations and to release the defending forces for combat elsewhere.

Notes

1. FOFA generated a vast literature in the early to mid-1980s. The case for FOFA is best outlined in the report of the European Security Study, *Strengthening Conventional Deterrence in Europe: Proposals for the 1980s* (New York: St. Martin's Press, 1983). The widely republished military and technical case against FOFA is in Steven L. Canby, *The Operational Limits of Emerging Technology*, Adelphi Paper No. 198, International Institute of Strategic Studies, Summer 1985. European politico-military perceptions are best presented in Karsten Voight's *Conventional Defence in Europe: A Comprehensive Evaluation*, North Atlantic Assembly Papers, December 1985.

2. Civil restrictions on bridge-bearing weights limit tanks to 70 tons. Soviet tanks can still add 20 tons, but Western tanks have already reached this limit. Their armor can be redistributed but more cannot be added.

3. William S. Lind, "Maneuver Warfare and Marine Aviation," *Marine Corps Gazette*, May 1989, 58.

4. Martin van Creveld, *The Training of Officers: From Military Professionalism to Irrelevance* (New York: Free Press, 1990), chapter 1.

Appendix

Operation Desert Shield/Storm

It is too early to assess the recent conflict in the Gulf. The facts are not all in. It has become apparent already that many official pronouncements during and after the war were hyperbole. Estimates of Iraqi strength have been reduced by two-thirds. Vaunted fortifications and sand berms did not exist. New technologies such as laser-guided missiles and cruise missiles were less accurate than originally claimed, and we know now that the Iraqis, while excellent at old-fashioned camouflage, knew little about high-technology countermeasures. And official assessments released after the war are known to be skewed to influence future budgetary battles on Capitol Hill.

Operation Desert Storm revealed many deficiencies. Any number of “what ifs?” could have made a big difference in the outcome of the conflict. Most obvious was the inability to handle coups de main. Another was the vulnerability of early-arriving light forces to Iraqi armor. Another shortfall was the state of readiness of US military units. Though the operational tempo of American units is high, unit cohesion and training proficiency are not high because of continuous personnel turnover. The personnel system caused other deficiencies, like (1) the inability to maintain low-cost political pressure upon Saddam Hussein by rotating out acclimated units and returning them quickly should fighting occur; and (2) the inability to sustain units in the region for indefinite periods without losing their cutting edge as large numbers of personnel pass through units in the same manner as occurred a quarter of a century earlier in Vietnam.

Desert Storm: True Maneuver Warfare?

However, these and other questions relating to technology and the political conduct of the war need not be addressed in

this appendix dealing with only one facet of the war—maneuver. The questions addressed here are narrow ones. How well did the Hail Mary maneuver—the sweeping movement of mobile forces from the extreme left of coalition forces into southern Iraq—conform to the claim that it was a maneuver-based envelopment of historical significance? How well did tactical air power adapt to the new maneuver doctrine advocated by the Army and Marine Corps? To evaluate these questions, we use the criteria developed in the case studies presented in this book.

Tempo

In Operation Desert Storm, units moved hundreds of kilometers in a matter of days. This compares well with Soviet operations in the latter part of World War II and in Manchuria in August 1945. Desert Storm, however, was more movement than maneuver, in part because the Iraqis themselves proved so passive. Given their passivity, tempo—the notion of entering into the enemy's observation-orientation-decision-action (OODA) cycle—never came into play. Tempo embodies the concept of acting before the other can react. The concept does not have much meaning if the other hardly reacts at all.

Evaluation is difficult when there has been no testing. However, several markers should be noted. In Desert Storm, Army units and one of the two Marine divisions attacked abreast, which implies there may have been little room for exercising tempo had the opportunity presented itself. At a critical juncture, VII Corps was apparently more interested in synchronizing the moves of its own components than in vigorously exploiting battlefield success by sending spearheads forward. More ominous were air operations with their lengthy preparations and complex tasking involving many kinds of aircraft, all of which had to be coordinated with each other. Air forces definitely were not oriented to the tempo of operations required for maneuver warfare.

Schwerpunkt

On public television watched by hundreds of millions, General H. Norman Schwarzkopf proclaimed his Hail Mary maneuver as the equivalent of a modern Cannae. This is hyperbole, for Hail Mary lacked the numerous subtleties built into Hannibal's entrapment of the Romans. Instead, the way Hail Mary was executed reminds one of the famous Schlieffen Plan in 1914: an infantry wheel attack carried out by mechanized formations. As such, the attack was linear (rather than thrusting). It lacked a discernible center of gravity, and operational reserves did not exist. An opponent with suitable forces and suitable commanders would have launched a major counterattack at the pivot between the allied wings. With no reserves, such a counterattack could have been extremely dangerous.

Had there been a center of gravity, where should the attack have been launched? Apparently VII Corps in the middle was considered the point of main effort. It is often difficult to discern the point of main effort, but in this case it was not. The Iraqi military had grossly overextended itself in and around Kuwait, and its complete lack of air cover meant it could not have responded to allied strategic and operational maneuvers. Given such circumstances, an armored thrust to Nasiriyah on the Euphrates and subsequently behind the large water barrier to Qurnah on the Tigris would have placed a stranglehold on the Iraqis (fig. 11). The block at Qurnah would have been difficult to dislodge because of the peculiar terrain. The block at Nasiriyah would have required an attack by Republican Guard divisions moving 150 kilometers in open desert. These divisions lacked air defense, and the Iraqi army has never demonstrated combined-arms proficiency.

Nothing was gained by attacking with the VII Corps and by moving the 24th Division along the road to Basrah except the pleasure of "kicking ass." In retrospect, this entire effort may have been a major political mistake because the ease

with which the Iraqis were destroyed by the coalition so panicked the Sunni Muslims fearful of increased Iranian influence that the Saudis in turn pressed for a quick cease-fire. The numerically smaller but politically dominant Iraqi Sunnis were forced into backing Saddam, however much they might have liked to have dumped him.

Alternatively, had the US forces been truly maneuver oriented, they might have launched a strategic thrust on Baghdad. This would have been successful because the Iraqis had made a major mistake in the deployment of their forces: the divergence between their militarily unprotected

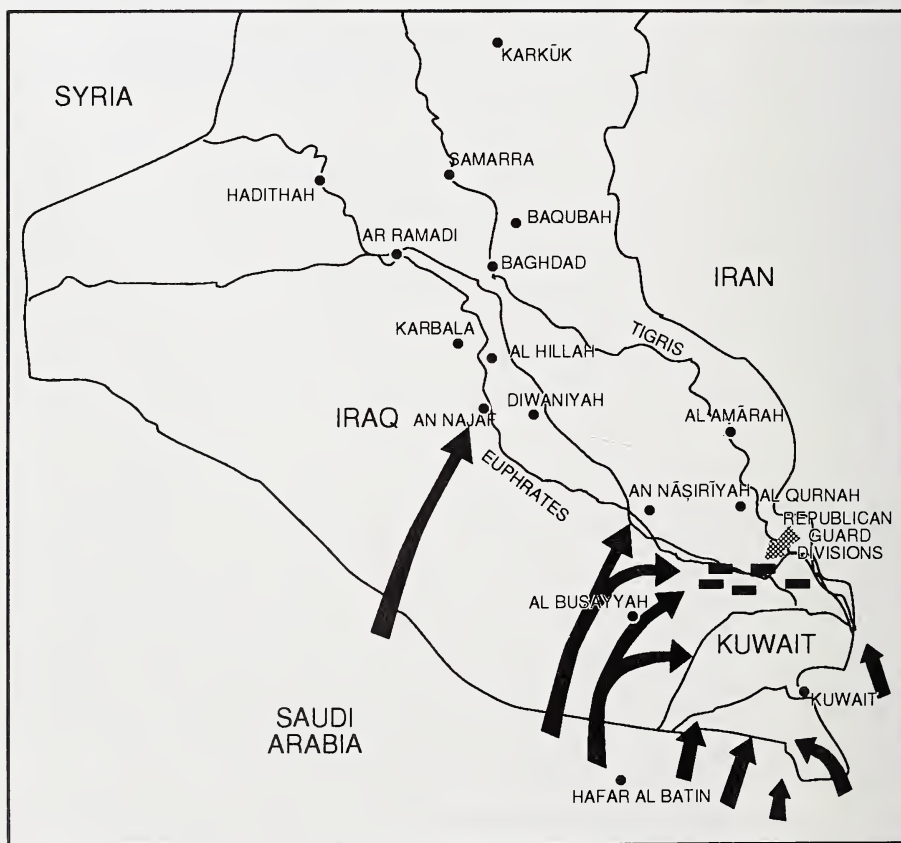


Figure 11. The Gulf Campaign, 1991

strategic center of gravity (Baghdad) and their operational center of gravity—the Republican Guard divisions southwest of Basrah. Within Kuwait, Iraq’s military position appeared tactically and operationally strong as long as her Republican Guards and main army were mutually supporting. Had the Iraqis proved strong, it would have been necessary to have drawn the Republican Guards away and to have strung them out in the desert so as to expose them to air attack and to break the mutual support, and with it the coherence of their defense in Kuwait.

A thrust to Baghdad would have served multiple objectives. It could have overthrown the regime, or it could simply have forced the Iraqis to cover Baghdad by moving Republican Guard divisions from Kuwait to Baghdad. One or the other falls. Either accomplishes the mission.

Surprise

The Hail Mary maneuver was a definite surprise to American television viewers at home. Everyone believed the attack would come in the form of a frontal assault, which in fact was the case to a limited extent. Both Marine divisions and the Arab divisions did attack frontally. Apparently, while the Iraqis thought the allies might attack in a narrow hook along the Wadi al Batin, they did not expect a wide flanking sweep. The desert was apparently thought to preclude that possibility. Thus, Desert Storm ranks high by this criterion. At the same time, since the sweep did take several days to slide out and sweep in, the Iraqis must be credited with poor intelligence and perhaps with a command system that was reluctant to pass along unwanted news.

Combined Arms

The Army and Marines fought in their accustomed combined-arms manner. Tactical air power was used as it has always been used in the past. It was not integrated into the ground maneuver scheme the same way as the Luftwaffe

and the Soviet air force were in World War II. It will be recalled that the Soviet air force, which of all the air forces in World War II was the most attuned to maneuver, only brought air power into play days before a major campaign was to begin.

In Desert Storm, a true maneuver orientation would have implied unleashing the ground attack almost immediately after air superiority was obtained. Air power would have focused its efforts on the region in front of the planned attack by VII Corps, thus ensuring that its moves would not have been obstructed by Iraqi ground forces. The attacks against Iraq's infrastructure would have been largely dispensed with, thus obviating the need for a prolonged air campaign that carried political risks.

If ever there were a case where tactical air power could have been integrated into the theater commander's scheme of maneuver for decisive effect, this was it. This effect would have been decisive had the plan been a strategic thrust to Baghdad. It would have been important, too, had the plan been a strategic turning movement aimed at Nasiriyah. These formulations would have given all services a combined-arms play as follows:

(1) The Marines, both those ashore and those afloat, would have *pinned* Iraqi infantry in place.

(2) Army heavy units would have served as the *magnet* to induce Iraqi mobile and static forces to become separated from each other by drawing the mobile arm into an exposed march.

(3) Air power would have acted as the *catalytic* force. It would have decimated exposed armor in movement and spoiled Iraqi operational tempo so that the Republican Guards themselves could have been pinned and enveloped by the Army.

Flexibility

Thanks to the prolonged deployment period and the suspension of the normal personnel replacement system, US

units were well trained, cohesive, and among the best ever deployed by this country, especially in the opening phase. Presumably, had they been tested by a proactive opponent, they would have displayed flexibility. However, their flexibility on the ground was never put to the test. Air operations, as earlier mentioned, failed this test.

Decentralized Command

A central tenet in German-style maneuver was the so-called *Auftragstaktik*, or mission-type orders. Each commander from corps down to the squad is given the unit's mission and allowed to plan and execute it himself. Soviet-style operational warfare was, by contrast, highly centralized. In Desert Storm, it appears that operations remained more or less as they have in the past, which is to say that they were centralized. Many senior officers, however, argue the contrary. It is difficult to sort this criterion out because at this time, "centralization" is too much like the "half-filled glass of water." What one asserts is mission orders is seen by another as a detailed directive.

Summary

To sum up, judged by maneuver warfare criteria, Operation Desert Storm lacked the most important criterion—the kind of interplay between opposing forces that an alert opponent would have created. As a result, it only contained at best a single and rather simple maneuver. That maneuver was carried out by the main striking force (VII Corps) without any clear thought concerning the role that other forces could play in the scheme. Within VII Corps itself, a clear *Schwerpunkt* was lacking. Apparently, there was more thought given to keeping one's own units abreast of each other than to rapid movement with the aim of penetrating deep into the Iraqi rear. True maneuver warfare would either have gone to Nasiriyah or sent a thrust to Baghdad,

thus forcing the Republican Guard to come out and fight; neither of these took place.

As to the air campaign, much of its month-long activity focused on Iraq's infrastructure and was therefore irrelevant to maneuver warfare. A maneuver-oriented air force would have done much less against the Iraqi rear and also avoided extensive strikes against Kuwait except, perhaps, as a way of pinning down the enemy and misleading him as to the location of the main effort. Instead, it would have waged a brief and concentrated campaign to facilitate the task of VII Corps; once the Hail Mary maneuver was under way, it would have focused on preventing movement by the Republican Guard or, should it have moved nevertheless, tearing it to pieces in the open desert. None of this is to criticize the performance of the USAF, which, as results show, achieved very significant victories at exceedingly low cost. It is, however, to say that Desert Storm was not a good example of maneuver warfare and that an air force that had this kind of warfare in mind would have acted differently from the way the USAF did.

THE INSTITUTE RESPONDS

This US Air Force view of maneuver warfare as described by author Martin van Creveld was prepared by military doctrine analysts within the Airpower Research Institute, an arm of Air University at Maxwell Air Force Base, Alabama.

The preceding chapters and the appended analysis of Operation Desert Storm represent a tremendous effort on the part of Martin van Creveld and those who assisted him in this study. It is useful in many ways, especially as a carefully documented reference work which provides insight into the synergies that can be created between various types of military arms working together (combined arms operations). The “rock-scissors-paper” illustration in chapter 1, “The Nature of the Beast,” is particularly apt. If accepted in the spirit intended, it highlights the very useful concept of applying strength against weakness to obtain leverage at the tactical level.

For the future, however, we agree with van Creveld that the real “money” is to be made at the operational and strategic levels. This is also the point at which our viewpoints begin to diverge. The bulk of this work is based on a view of the battlefield “from the ground up.” When viewed this way, it is very logical that maneuver is something that happens on the surface. Other realms, like the aerospace or suboceanic regions, are only significant in terms of how they affect surface action. It makes good sense from this perspective to place air weapons at the disposal of the surface commanders and to measure their performance in terms of their impact on surface operations. This viewpoint, usually blamed on Carl von Clausewitz, seems particularly unfair since he wrote at a time when airborne action could be only a dream at best and had no real relevance to warfare. We will return to this point later.

The natural instinct of many airmen is to take immediate exception and to insist instead upon a “top-down” view. From this viewpoint, ground operations are insignificant except in terms of the many things “down there” that are destroyed or held at risk and certain human reactions to the devastation achieved. “Command of the air” is everything and will bring victory.¹ This visceral reaction is usually interpreted as both arrogant and uninformed by those who hold the ground-up view. What the two sides have managed

to achieve so far in this debate is to polarize the issue to such an extent that only these two (very extreme) viewpoints are recognized: air power² is a supporting arm for ground maneuver, or air power is the sole instrument of victory. As is usual with extremes, both views miss the mark.

There is a third viewpoint—a central ground between the two poles. The old idea of the battlefield, whether viewed from the surface or from above the surface, tends to blind us to this perspective. The battlefield, as we have customarily viewed it, is a two-dimensional place, whereas modern war is fought in at least three dimensions (not to mention the impact of time, which is discussed elsewhere in this volume in terms of tempo). To accommodate this reality, we must learn to view the battle area in three dimensions.³ We suggest that this battle area should be understood as a globe encompassing surface, subsurface (especially at sea), and the aerospace. Actions within the globe are all interrelated. None are, by nature, universally independent of, nor dependent upon, the others.

What is even more important is to relate the battle area and operations within the battle area to the ancient military principle of the objective. It seems curious that van Creveld, who has discussed a number of principles in terms of their relationship to maneuver warfare (tempo, *Schwerpunkt*, surprise, combined arms, flexibility, decentralized command), fails to mention at all the relationship between objective (one of the key principles of war recognized in all US military doctrine) and operations. As most often happens when war is viewed from the ground up, van Creveld seems tacitly to assume that the primary objective of warfare is *always* the defeat of the opposing army.

There are two vital flaws in this assumption. First, defeat of the army is a military objective, not a political one. If, as von Clausewitz contends, war is the “continuation of political intercourse, carried on with other means,”⁴ then the military objective of defeating the opposing army is cogent only if it contributes to the political objectives. In other

words, this military objective should only be adopted if defeat of the enemy army is required to achieve national goals.

For example, had the North Vietnamese and the Vietcong persisted in attempting to defeat the US Army, they might well have lost the war. Instead, they defeated first the will of the US government and people (a political goal) while mostly avoiding our armed forces (a military goal), and then soundly trounced the isolated South Vietnamese army. Therefore, the relevance of the surface army as a military objective is clearly situation-dependent.

If we adopt a military doctrine (like maneuver warfare as described in previous chapters) that commits us to the pursuit of only one of many possible military objectives (defeat of the enemy army), we will not have served our nation well. Doctrine must be flexible enough to allow pursuit of our political objectives by the most appropriate means. The level of fixation on enemy surface (especially ground) forces, which, as described herein, maneuver warfare encourages, does not provide this kind of flexibility. We should view it as one "tool," potentially useful in the right set of circumstances but not as a prescription for warfare in general.

The second problem with this fixation on the enemy army is that it brings unreasoning orientation on control of surface areas and a concomitant orientation on the progress of our own surface forces. This orientation most frequently manifests itself in obsession with the movement of flags and arrows on a surface map (or "body counts" when flags and arrows won't work). This obsession can be seen in most of the works produced so far on the operations during Operation Desert Storm. Forty-two days of warfare are most often depicted and discussed in terms of the progress of allied armies over the last four days. Relatively speaking, the air campaign's contribution to the four stated US political objectives of Desert Storm is not so obscure as this would suggest. Nonetheless, it appears to be the best most reporters of the war can do.

This obsession with flags and arrows drives us to do, on a grander scale (at the operational level), precisely what van Creveld eschews at the tactical level—force application of like on like, our army versus their army. If this flawed view is accepted at the operational level, it only makes sense that all other types of arms be subordinated to the ground arm since the only thing that really matters is what happens on the ground.

If you ascribe to this view, surface forces are preeminent because “*only ground forces* possess the power to exercise direct, continuing and comprehensive control over land, its resources, and its people.”⁵ This could (and will if we are not careful) cause us to engage in unnecessary, and unnecessarily costly, surface operations in future scenarios. What if the political objective could be achieved, for instance, by excluding use of the airspace over southern Iraq (as seems true at the moment this is being written)? No level of effort on the ground, short of conquering the entire nation, could meet that objective.

This is not intended to be an argument about the preeminence of one form of warfare over another but merely to highlight the point that the objective is an important military principle that can drastically alter one’s view of a particular type of warfare. If the method of conducting a war (or other military operation) is not matched to the objectives (both political and military), the outcome can be disastrous. Vietnam should serve as a key reminder of this for Americans;⁶ orienting on the opposing army without defining higher objectives is wasteful and counterproductive.

This brings into question the entire discussion of maneuver-versus-attrition warfare as presented in the balance of this volume (though not the value of such discussions relative to a potentially powerful tool we might use for political objectives—a somewhat subtle difference we hope the reader will readily see). From van Creveld’s discussion, it seems apparent that he deems maneuver warfare to be generally more efficient and effective than attrition warfare.

Both the US Army and Marine Corps apparently are attempting to commit to maneuver warfare rather than to the attrition model. They seem to agree with van Creveld that maneuver warfare is preferred over attrition, but once again, certain key points may be overlooked in this analysis. For example, what do you do if the adversary proves to be better at maneuver warfare than you are but you possess vastly greater resources? If your sole objective is to prosecute a “clean war,” then you might persist in attempting to “outmaneuver” the opponent and simply accept defeat if you fail.

Unfortunately, such persistence is almost a guaranteed formula for defeat. It would seem more prudent in this particular case to try to shift the struggle to an attrition model because this course is the most likely to change your fortunes. That is precisely what Lincoln, Grant, and Sherman did with great success during the American Civil War.

Nor is it any fairer to accuse the American military of blindly following the attrition model ever since. For example, though most of the southwest Pacific theater of operations in World War II was composed of water, US operations represented classic maneuver warfare—moving from key island to key island, bypassing the bulk of the Japanese army in isolated positions and leaving them to “die on the vine.” The ultimate success of this strategy was avoidance of a horribly expensive force-on-force assault upon the Japanese home islands.

At least portions of the campaigns in North Africa, Italy, and Europe during World War II and the Korean War in the 1950s should not be ignored either. Certainly each of these is debatable as an example of pure maneuver warfare, but this debate completely ignores one key point: a “pure” example of either style of warfare is a highly unlikely occurrence.

Surely attrition is a factor in maneuver warfare and maneuver is a factor in attrition warfare. We are necessarily talking emphasis and nuance here. It would seem to be somewhat a priori, for example, to dismiss Desert Storm as

an example of maneuver warfare simply because the military objective was inappropriately selected (the Basrah area instead of Baghdad), if indeed it was. However we may feel about other particular examples of the genre, it is important to remember for the remainder of this discussion that we are analyzing a very narrow data base. Van Creveld's three fairly homogeneous examples (Germany in 1941–42, the Soviet Union in World War II, and Israel in 1967 and 1973) can offer food for thought, but certainly not statistical significance. Under such circumstances, it is all too easy to learn lessons of limited applicability, a common danger of the “lessons-learned” approach to military studies. The greatest danger lies in applying such lessons too broadly.

The bottom line here is that the seeming American propensity for attrition warfare may be more a result of our comparative strengths and weaknesses relative to most adversaries we have faced than to a blind reliance on “old thinking.” For most of our history, we have not maintained large standing armed forces. Very rarely have such forces as we have maintained been well organized, trained, or equipped in the period immediately preceding a major war. Usually we have had to build our forces mostly from scratch. On the other hand, our adversaries have usually been well organized, trained, and equipped at the time we have entered the conflict. Our strength has been to produce, in a relatively short time, very large and adequately trained forces armed (at least initially) with marginally effective equipment. In such a case, if defeat of the enemy army is a key military objective, the attrition model would seem our logical choice.

All of this suggests that adopting a “doctrine” of maneuver warfare would be extremely dangerous, particularly at a time when we are drawing down our forces as rapidly as we are now doing. Van Creveld writes, “In general, armies deficient in maneuver qualities should avoid maneuvering against an opponent strong in these attributes” (p. 208). Only in such cases where the enemy army is legitimately our chief

military objective and where we are better at maneuver-type warfare than our adversary is it likely to produce satisfactory results. If we are irrevocably committed to it and either of these situations does not prevail, it will prove decidedly unsatisfactory.

Van Creveld himself acknowledges that conditions do not always favor maneuver warfare. "Spain offered few opportunities for maneuver warfare" in the 1930s (p. 31); a "combination of circumstances had the effect of gradually bringing *operativ* warfare to an end" for the Germans in Russia (p. 97); and, for Israel, maneuver warfare "may soon be no longer viable" (p. 189). There are several other examples as well. All of this having been said, maneuver warfare should be part of our military doctrine, but we must reject it as a universal military doctrine. However, with that understood, maneuver warfare remains a potentially useful tool of any military, and we would like to continue this discussion by offering some specific alternatives to other portions of van Creveld's analysis.

Though van Creveld continually references the equality of arms in combined arms operations, his ground-up view of the battlefield leads to an analytic error that surface-oriented thinkers often make. In fact, it is US Army doctrine. According to Field Manual (FM) 100-5, *Operations*, the Army's position is that since all services are "equal" and work together to defeat the enemy, air *support* must be coordinated with the main effort. This doesn't seem very equal, and there is no quid pro quo. Never, except in extremis, does the Army anticipate coordinating surface maneuver with air operations.⁷

While van Creveld appears to glimpse the alternative view, we do not believe he carries it far enough. In reference to the Israeli experiences of 1967 and 1973, his sixth conclusion is that "an air force must be allowed to conduct an anti-air operation prior to its full commitment to the ground battle" (p. 186). Presumably this means either that the main effort (surface) must go unsupported (or less than

fully supported) by air operations while the air battle is waged, or that the air forces would, at least temporarily, be the main effort and should therefore *be* supported as necessary by surface operations.

Following Desert Storm, the latter conclusion would seem the more appropriate. Why not keep the surface troops out of harm's way until the conditions for their success (air superiority) are established? A more complete analysis of Desert Storm (which we are still awaiting) will offer superb examples of how surface forces could (and did) support the main effort in the air. Beginning large-scale ground operations during the air phase would cause unnecessary dispersion of effort.

Many military strategists having observed the application of modern technology to aerospace systems and weapons now believe that success in the air and space is a necessary precondition to success on the surface. The Russians have rewritten their entire military doctrine based upon this premise.⁸ Of course, this concept is not readily understood when viewed from the two-dimensional battlefield, so our understanding has been slowed even though this precondition has existed for a long time.

If the progress of war is modeled with flags and arrows on a surface map, the impact of strategic attack on C³ systems, to offer just one example, has no readily apparent relevance to the battle. How the surface forces flow across the battlefield—whether they flank, turn, or sweep and how far they progress in a day—these are the important “measures” of operational success. Yet, if we are to accept Col John Boyd's OODA loop, as van Creveld does in this text, then the *fact* that the Iraqi decision cycle was extended to over 48 hours (the time it took for one message cycle between Baghdad and the front) as a result of the air war must have *some* relevance to the final outcome. It would seem to have established conditions under which maneuvers by coalition forces against the enemy were virtually guaranteed success. It makes little difference that the adversary hardly reacted

at all (p. 214), particularly as it was precisely this strategic disconnect (lack of operating C³) that made it largely impossible for him to react.

Of course, a maneuver-oriented army organized with a “decentralized command” structure would not have waited for orders from Baghdad. They would have “launched a major counterattack at the pivot between the allied wings” (p. 215). The only problem is that they did not know there were “allied wings,” much less where they were.

The air campaign was deliberately planned to take away this ability—not just in the area of the *Schwerpunkt* but everywhere across the battlefield. This allowed surface forces to operate *anywhere* with impunity (and with phenomenally low casualties), while at the same time concealing the *Schwerpunkt*. As a result, the center of gravity of allied ground operations was not readily discernible.⁹ Wherever our surface forces went, they could rest assured the enemy did not know they were coming. For the air commanders, it was not a case of disrupting and interfering with the enemy’s tempo—they intended to destroy it, and they did.

The kind of air battle that achieved these dramatic results—an air battle designed to disconnect, disrupt, and blind enemy forces at all levels from strategic to tactical—is precisely what airmen have been propounding for most of the last 70 years. It is a battle in which air power meets the objective of maneuver—shattering “the enemy’s cohesion, organization, and psychological balance” without solely focusing on the enemy’s physical destruction.¹⁰ This is not the “Douhet theory of strategic bombing” (p. 145), though much of what Douhet said (in the abstract, as opposed to the particular) has come true.

In 1935, the US Army Air Corps Tactical School argued that “even though air warfare may be waged simultaneously against both the enemy armed forces and the enemy national structure, the main purpose of the air offensive will be to nullify the former so as to permit breaking down or

conclusively threatening the latter.”¹¹ This has no flavor of the “air battle for its own sake” (p. 145). Nor did such a flavor become pervasive over time in air doctrine, as is often charged by critics of the USAF. Army Field Manual 100-20, *Command and Employment of Air Power*, written in 1943 to cement the hard lessons learned by Allied air forces in 1941 and 1942, said,

Air forces must be employed primarily against the enemy’s air forces until air superiority is obtained. In this way only can destructive and demoralizing air attacks against land forces be minimized and the inherent mobility of modern land and air forces be exploited to the fullest. . . . The inherent flexibility of air power is its greatest asset. This flexibility makes it possible to employ the whole weight of the available air power against selected areas in turn; such concentrated use of the air striking force is a battle winning factor of the first importance.¹²

The characterization of “basic tasks” in FM 100-20 makes the point even clearer. They are:

a. Destroy hostile air forces. This will be accomplished by attacks against aircraft in the air and on the ground, and against enemy installations which he requires for the application of air power; b. Deny the establishment (sic) and destroy existing hostile bases from which an enemy can conduct operations on land, sea, or in the air; c. Operate against hostile land or sea forces, the location and strength of which are such as to threaten the vital interests of the United States or its Allies; d. Wage offensive air warfare against the sources of strength, military and economic, of the enemies of the United States and its Allies, in the furtherance of approved war policies; e. Operate as a part of the task forces in the conduct of military operations; f. Operate in conjunction with or in lieu of naval forces.¹³

While air superiority gets top billing in every case, never does this basic doctrine manual of air power application seem to imply either that it is “for its own sake” or that it alone will defeat the enemy. Air superiority gets priority in FM 100-20 only because it is necessary to avoid “destructive and demoralizing air attacks against land forces” and to exploit “the inherent mobility of modern land and air forces. . . .” Destruction of enemy air is one of the several things air can

do “that no other arm can do that will have a *decisive* effect on the outcome of the ground battle”¹⁴ (p. 205), if one is necessary to achieve military and ultimately political objectives. Though well-developed and integrated ground-based air defenses can provide limited (i.e., limited both in time and space) protection from even a powerful air force, history has thus far favored the air weapon in virtually every case. Given time, a ground-based system unsupported by air will be broken down by air attacks, whether supported from the ground or not.

Air superiority, then, is not its own object but a precondition to success in other operations—surface and air. Nor have airmen forgotten the lessons that led to this articulation of FM 100-20. The current mission statement of the USAF is “to defend the United States through the *control and exploitation* of air and space.”¹⁵ This mission is supported by current USAF doctrine:

Aerospace power can apply force against any facet of enemy power. . . . Aerospace forces perform four basic roles: aerospace control, force application, force enhancement, and force support. . . . There is no universal formula for the proper employment of aerospace power in a campaign. . . .¹⁶

The latter statement is a direct acknowledgment that employment of military force (not just aerospace forces) must be relevant to objectives—tactical, operational, and strategic.¹⁷

This interpretation is very much in synch with the operations of our maneuver-oriented examples. In nearly every case (especially the successful ones), the Germans in World War II began their offensives with efforts to gain air ascendancy before concentrating on support of *operativ* warfare. In fact, this is a well-recognized practice as reported in this study: “At 0300, 22 June 1941, the Luftwaffe opened the campaign by the *now-standard method* [emphasis added] of a surprise strike at the enemy’s airfields” (p. 69). In fact, the Luftwaffe’s overall tasking is reminiscent of FM 100-20:

The task of the Luftwaffe was defined as (1) knocking out the Soviet Air Force in order to obtain and maintain air superiority over the theater of operations; (2) supporting the operations of Army Group Center . . . (3) disrupting the Soviet railway net . . . and (4) capturing important transportation bottlenecks.¹⁸

It was air superiority first, not “for its own sake.”

The Soviets, never able to achieve such dominance in the air, were reduced to limiting their activities to within 10 kilometers of the front. While van Creveld seems to imply that this was a doctrinal imperative, it is only so in the sense that the Soviets never possessed the resources to claim total dominance in the air. What this meant for them was that, while the “technological excellence” of the Germans was “offset . . . by the Allied bombing campaign which disrupted the German war economy and prevented the new weapons (particularly heavy tanks) from being deployed in large numbers” (pp. 132–33), the Soviets continued to suffer at the hands of the Luftwaffe, which, even in the later stages of the war, “still found it possible to execute their missions” (p. 142). In Western Europe, on the other hand, Luftwaffe crews were not able to execute because “they found themselves engaged in combat almost as soon as they left the ground” (p. 141). Thus, it would appear that the 10-kilometer limitation was more the invention of necessity than design. It was also very costly in terms of lost equipment, though often successful in saving crew members from capture by the enemy (due to their proximity to friendly surface forces).

In the Arab-Israeli wars, it is completely clear that the Israelis have perceived the value of air superiority for more than just its own sake. Their success in 1967 was directly attributable to their ability to achieve air superiority. By catching the Egyptian air force napping, they taught the Egyptian army the consequences of operations without air superiority. In 1973, the Israelis paid dearly for failing to achieve the same kind of dominance at the outset. It is worth noting, however, that over time they were able to

reassert their dominance over ground-based air defenses and to effect a relatively favorable outcome.

The Israelis' total air dominance in 1967 enabled them to have successes of all kinds, even the most improbable. A good example was resupply of the *ugdás* by air with highly vulnerable World War II-vintage aircraft. Without this resupply, "the Egyptian breakout might conceivably have succeeded" (p. 168). Air dominance also enabled Israeli convoys made up of "road-bound, requisitioned, civilian vehicles of every sort and description" to succeed, while the Egyptian retreat was interdicted by "every type of combat aircraft" (p. 168). Both scenes are reminiscent of Desert Storm, where allied logistics convoys snaked in single file over endless miles of desert, while the attempted breakout from Kuwait City in "road-bound, requisitioned, civilian vehicles" became the now famous "highway of death." It was control *and* exploitation of air and space, not "an air battle for its own sake."

The above reasoning should also dispel the accusation that airmen wish to pursue the air superiority battle at the expense of ground support. In fact, the air battle makes interdiction and close air support (when it is necessary) even more effective. Mission number one, discovered by US Army Air Forces in North Africa in 1942, is to keep enemy air forces off the backs of our own forces.¹⁹ This provides one of several key reasons for prosecuting the air battle first and foremost. There are others. For example, referring to the war in 1967, van Creveld states, "Having successfully defeated the Jordanian, Syrian, and Iraqi air forces in addition to the Egyptian one, the IAF *on the second day* [emphasis added] of the war turned back to the Sinai where it enjoyed complete command of the air" (p. 168). As already mentioned, this allowed the Israelis to resupply forward forces with obsolescent transports and to attack road-bound Egyptian motorized columns, "thousands of which littered the desert either as burned-out wrecks or intact vehicles that had been deserted by their terrified crews." This was possible because "IAF

pilots could loiter over the target area and make multiple pass attacks” (p. 168). In other words, they wreaked havoc because they *owned* the air.

Contrast this picture with 1973, when, “though air superiority was ultimately achieved, it was never quite complete” (p. 181). In this case, it was necessary to shift the IAF “from front to front, role to role, in reaction to immediate threats without implementing any cohesive air operational plan” (p. 181). The perceived operational imperatives which resulted caused dispersion of the air effort to attempt intervention in every crisis on the surface. Since they could not concentrate their efforts anywhere, they wound up acting as the proverbial “fire brigade.” In the end, “about 65 percent of the IAF’s operational sorties represented air-to-ground missions. . . . Most sorties were flown in the CAS/BAI roles and, on the whole, were quite ineffective” (p. 183).

It is, in fact, not the attempt to achieve air superiority that causes dispersion of effort away from surface support but the failure to do so. The 14 May 1940 Allied air attack against bridges in the Ardennes serves as an excellent example: “By the evening, the smoking remains of 89 Allied aircraft dotted the countryside around Sedan alone. It was *perhaps the decisive moment* [emphasis added] of the entire campaign” (p. 51). Air superiority, had it been achievable, could have prevented this disaster for the Allies and this “decisive moment” might have gone the other way.

Lack of air superiority appears to have forced the Soviets in World War II to emphasize “close operations” (within 10 kilometers of the front) to the near exclusion of what we would now call “deep operations.” This appears to be viewed as doctrinally sound elsewhere in this study. Considering the technical capability of the Soviets to do otherwise, this may be fair, but as a universal doctrine of preference, it fails the test.

Targets for Soviet aviation tended to be restricted within this area “because of the fear of German fighters” (p. 130), not because it was Soviet doctrine. “The Soviet High

Command, recognizing the Soviets' absolute inferiority, ordered survival tactics for their fighter and ground attack aircraft" (p. 136). However, "after 1943, strikes at greater depth and attacks on various rear installations became more common" (p. 130). This was true, not because the Soviets changed their thinking but because it became possible to do so. The reason it became *possible* is that "the longer the war, the more the Germans were forced by Anglo-American strategic bombing to become an air defense air force against strategic attacks" (p. 144). Thus, the successful concentration of Anglo-American efforts on air superiority and strategic bombing *caused* the dispersion of German resources from which the Soviets indirectly benefited.

Another key example was the total air supremacy over Normandy that allowed concentration on the bombing, strafing, airdropping, and other *integrated* air operations required by the massive Allied invasion of Western Europe. The term *integrated operations* (air, land, sea, and space) is the real key to an airman's perspective of the battle area.

The argument (which is somewhat expanded upon in the bulk of this text) over which "tool" of air power is the greatest contributor to surface operations is counterproductive to a comprehensive understanding of the dominance air power *can* have over the modern conventional battlefield when our objectives require it and conditions are right.

For too long, air and land power enthusiasts have been locked in a dichotomous debate over the uses of air power. Which is the best use of air power—close air support or counterair? The correct response to this question is not, as van Creveld seems to imply, interdiction. The correct response is, What are my objectives? Whatever the objectives are, air power brings a comprehensive set of tools to the battle, and the integrated application of the right combination of these tools with those provided by surface forces should be the real goal. This principle is amply demonstrated within this text.

In every case presented in this volume, the victor either secured air superiority or used work-arounds until it was

secured.²⁰ USAF basic doctrine calls this function “aerospace control” and posits that aerospace control “is a prerequisite to accomplishing other aerospace roles and missions.”²¹ Aerospace control is not to be achieved “for its own sake.” Rather, it “assures the friendly use of the environment while denying its use to an enemy.”²² This is in complete concert with the Air Force’s mission—the control and exploitation of air and space. It is also in concert with every case presented in this text. In each case, force application of *all types* was enhanced by “command of the air” or degraded by the lack of it.²³

According to USAF doctrine, “force application brings aerospace power to bear directly against surface targets.” This includes “strategic attack, interdiction, and close air support.” “Force enhancement increases the ability of aerospace and surface forces to perform their missions.” Force enhancement missions are such things as “airlift, air refueling, spacelift, electronic combat, surveillance and reconnaissance, and special operations.” Finally, “force support must sustain operations if aerospace forces are to be successful.”²⁴ Examples of all these functions are well represented, both in application and misapplication, throughout this study. They are much too numerous to list, so we leave it to the reader to ferret them out.

The point is that there is not one *particular* application of air power that represents air power’s chief strength. It is not close air support, interdiction, strategic attack, counterair operations, airlift, electronic combat, or any other element that is decisive. It is the application of the appropriate ones to the situation at hand in light of both the political and military objectives that defines the utility of air power. Air power can go it alone,²⁵ lead,²⁶ or follow,²⁷ as the situation demands.

The easiest way to demonstrate this is to evaluate the utility of air power in van Creveld’s own terms of the six “vital elements.” Van Creveld has identified tempo, *Schwerpunkt*, surprise, combined arms, flexibility, and

decentralized command as characterizing maneuver warfare in the opening chapter of this book. We have assumed our political objectives translate logically into military objectives that include defeat or destruction of the enemy army and that we have a reasonable expectation of prevailing over the specific enemy in a maneuver contest.²⁸ Having accepted these assumptions, we can examine what air power can contribute to the effort.

The first vital element identified in chapter 1 is tempo (p. 3). Van Creveld closely associates this element with Col John Boyd's OODA loop. The objective is to get inside the adversary's decision cycle. There are two basic approaches to doing this. The first is pretty straightforward—cycle faster than the adversary can. The second is perhaps less obvious, mainly because in most cases it is more difficult to do—degrade the adversary's cycle until it is slower than yours. Air power can contribute to both approaches.

The inherent speed, range, and flexibility of aircraft (the same applies more and more clearly to spacecraft) make them ideal contributors to the tempo of operations. Achieving aerospace control “assures the friendly use of the environment while denying its use to an enemy.”²⁹ In Desert Storm, air supremacy allowed coalition forces to ensure nearly constant observation of the entire area of operations. Conversely, this complete control of the environment meant the adversary, Iraq, had virtually no opportunity to observe coalition preparations and operations above the tactical level, and only rarely at that level. While we knew precisely how and where Iraqi forces were deployed, they could only guess at coalition deployments.

In the initial attack, coalition aircraft and missiles quickly destroyed almost the entire Iraqi C³I network. They could not see the battlefield beyond what they could observe visually from static emplacements, nor could they communicate what little they did know to others. Message traffic by courier, the only means available to most units after D day, took 24 hours

or more to reach the rear area where it could be processed and disseminated.

Orientation is nearly impossible when observation does not occur. Most coalition decisions after D day were based on minutes-to-hours-old information. Iraqi decisions were made on information that was days to weeks old, and then could not be coordinated between units. Our decision cycles were measured in minutes; theirs in days. That explains why, in many cases, coalition ground forces were shooting at Iraqi forces that didn't even know the coalition forces were there, much less from which direction they were coming.

When you have aerospace control, your aircraft can transit dozens of miles in minutes, literally hundreds in an hour, and affect the battle wherever and whenever you choose. They can provide real-time information from any battle area you wish. They can rush to any critical point in the battle area, acting as a central reserve that is quickly and easily redirected when necessary. They can provide resupply to rapidly advancing or beleaguered forces anywhere in the battle area. They can also protect rear areas from attack and screen advancing or retreating forces against surprise counterattacks. Each of the cases discussed in this book contains examples of nearly every one of these capabilities of air power. Air forces both operate at high tempo and enhance the security of surface forces so that the latter can increase their tempo. In short, used properly, integrated air power is a preeminent tool for increasing operations tempo.

As for the second theme of maneuver operations, *Schwerpunkt*, it seems intuitive after all the preceding discussion that air power represents a superior tool for developing the necessary "force ratios" for breakthroughs at critical points. Both the Germans and the Soviets demonstrated this in their use of air forces as "can openers" for ground offensives. In Operation Desert Storm, air forces *provided* the initial *Schwerpunkt* to achieve the operational leverage described in the above discussion of tempo.

In the future we can expect air forces again to be called upon to provide the *Schwerpunkt* against C³I and air defenses, as well as to be the “can openers” for surface breakthroughs. Since discerning that the appropriate “fault line” for the *Schwerpunkt* is critical, and since the “thrusting” nature of an offensive maneuver leaves potentially vulnerable flanks open to an aggressive enemy, air forces will continue to provide a necessary “fire brigade” reserve for blunting counterattacks. Again, both of these functions are well represented in the cases discussed here.

Airlift provides means of quickly building and supplying the necessary preponderance of surface forces to develop a surface *Schwerpunkt*, as demonstrated by the phenomenal buildup to the west for Desert Storm. Such buildups are possible only when they are protected from air attack and effective only when they are not observed and countered. Both of these necessary conditions were provided in Desert Storm by the coalition’s complete control of the aerospace. Once again, the real strength of air power is in the integrated application of all its facets, not concentration on any single one.

Air power’s potential contribution to surprise, the third of our principles of maneuver warfare, is also dramatic. To fall upon the enemy “like a thunderbolt” is another of air power’s natural attributes. With speed, range, precision, and now stealth, air forces can achieve tactical surprise with ease in most scenarios. Only minor deception is then required to achieve both operational and strategic surprise. In Baghdad, antiaircraft gunners were usually shooting at empty sky from which a stealth bomber had already exited. The proof of this is clear. F-117s destroyed targets in downtown Baghdad night after night without being touched a single time by enemy fire. In the Kuwaiti theater of operations, crews slept away from their tanks, which were disintegrated without the slightest warning, victims of attack by coalition aircraft flying so high they were invisible to the soldiers.

Air power can also contribute to surprise, as it did in Desert Storm, through control of the aerospace to deny enemy observations, electronic warfare to degrade warning and defense systems, movement of troops and supplies faster than the enemy can react (airlift, airborne assault, air assault landings), and the shift of the central axis of effort faster than the enemy can compensate.

Any modern state is vulnerable to the kind of intense surprise strategic assault mounted against Iraq in January 1991. No army disconnected from central leadership and disjointed from command structure, as the Iraqi army was, can possibly operate at the operational or strategic level. Its best tactical efforts, no matter how carefully it has cultured a “decentralized command” system, will achieve nothing operationally or strategically, unless by accident. The Iraqi army was not helpless by nature; it was rendered helpless by an air assault that quickly reduced its tempo to almost zero. The nearly complete surprise of the initial assault increased the psychological, as well as the physical, impact.

As mentioned very early in this chapter, the rock-scissors-paper analogy seems very useful in describing the theme of combined arms, but it is lacking in one way. In the game, scissors always defeat paper, paper always defeats rock, and rock always defeats scissors. In warfare that simply is not true. Actually, artillery is not powerless against tanks, as Erwin Rommel proved in North Africa by using the famous German 88-millimeter antiaircraft artillery against tanks with great success. For numerous reasons, artillery can be at a severe disadvantage against tanks. However, when conditions preclude direct fire, tanks are totally helpless against artillery that can range them.

Warfare is never so neat as to allow the careful selection of a weapon for each engagement. Just as with the rock-scissors-paper game, you must engage the enemy with whatever is at hand when you meet him. Unlike the situation in the game, however, the outcome is not foregone by this selection. Tanks can kill artillery; artillery can kill tanks. Antitank

weapons can kill tanks; tanks can kill antitank weapons. The objective is to engage in such a way as to gain relative advantages over the adversary through the proper coordination of combined arms.

For instance, tanks moving to contact are vulnerable to artillery while they are still out of range of their objective. The longer they are subjected to artillery fire before they can achieve close contact, the better for the adversary. The tankers' objective, then, should be to close fast enough to turn it quickly into a direct-fire fight, where they have the advantage. If they must transit areas where there are enemy tanks, antitank weapons, and infantry, they will never achieve a favorable condition unless they are supported closely by the same. If they do continue an unsupported attack in such a case, they are likely to be destroyed—some by artillery, some by tanks, some by antitank munitions, some by aircraft, and some even by infantry. The objective of combined arms, then, should be to create the conditions in which the defender in our example found himself—facing an adversary of single arms with his own integrated combined arms team.

In its modern incarnation, air power is possessed of the unique capability of almost being its own combined arms team. With modern avionics, targeting/surveillance systems, and lethal/nonlethal weapons, aircraft are capable of both direct and indirect fire (called "standoff" in the air business). They can maneuver so rapidly as to close or stand off, whichever is to their advantage. With a combination of missiles, bombs, and guns, they have options that can destroy or incapacitate almost any target they face. With stealth, speed, or standoff munitions, they can shoot while almost invulnerable to most counter systems because most battlefield systems are essentially incapable of either defending themselves against air or *directly* threatening airborne systems. Additionally, with their speed and range, aircraft can rapidly shift from one target set to another.

In the case of Desert Storm, aircraft destroyed a wide spectrum of battlefield systems with relative invulnerability. Literally thousands of tanks, armored personnel carriers, artillery pieces, bunkers, and the like were destroyed at the cost of a handful of airplanes. One is at a loss to understand why, under such conditions, anyone would want to start a ground war in the first few days of such an operation, when waiting will reduce enemy capabilities (physical and psychological) dramatically. Once the ground war does start, however, integrated air power continues to be a powerful combined-arms team member.

Air power can support ground maneuver by taking on any type of target that is presenting problems to the surface team. Aircraft can lead assaults by attacking opposing forces of all types, help screen and protect flanks and rear areas of maneuvering surface forces, carry or cover assault teams, resupply forward or isolated forces, provide reconnaissance information to surface force commanders, destroy isolated forces that threaten the surface force, or do almost anything you can think of to support surface maneuver. Again, the speed, range, and flexibility of air power make it a superb tool in creating the kind of synergy between friendly forces that creates insoluble problems for the adversary's commanders and produces lethal imbalances between your combined-arms team and the adversary's forces.

Air power is a powerful contributor to combined-arms flexibility. When you accept the integrated view of air power, you readily see the tremendous synergies that can be created by combining the many strengths of air power with one another and with those of surface forces. The speed with which aircraft transit battle areas allows them to be redirected easily, especially when they are combined with modern command and control systems—including airborne systems like the airborne warning and control system (AWACS), the airborne battlefield command and control center (ABCCC), and the joint surveillance and target attack radar system (JSTARS). A combination of improved

technologies (avionics, stores attachments, targeting systems, and the like) allows many aircraft to be easily shifted from one role to another (F-16s from air defense to interdiction to close air support, for instance). Modern systems design and maintenance practices allow aircraft to be turned from one role to another quickly between missions. Many can even be configured for multiple roles on a single mission.

There were numerous cases during Desert Storm, for example, where aircraft were diverted from one type mission to another and at least one particular case where they were deliberately planned to provide the option of diverting to another mission. Gen Charles A. Horner developed an air support system for the US Central Command (CENTCOM) area of responsibility ground forces known as "Push-CAS." In this system, aircraft were loaded and stood up on alert for "immediate close-air-support" requirements. If they were not needed within a particular period of time, they were launched on preplanned interdiction missions. Even during their ingress for the interdiction mission, they were subject to diversion to immediate CAS requirements. Thus, both immediate close-air-support and interdiction requirements were met without loss of alert sorties to the unpredictability of close-air-support requirements. Innovative thinking, aerospace weapon systems, and modern C³I can create incredible flexibility for the theater CINC. In the old days we said, "Flexibility is the key to air power." It now seems more correct to say, "Air power is the key to flexibility."

Finally, it is necessary to discuss the maneuver principle of *decentralized command*. Van Creveld makes a major point of the "anathema" of Soviet centralized command to maneuver warfare. Yet in every case, what he describes as decentralized command appears to us more in concert with the USAF conceptualization of "centralized control/decentralized execution." In AFM 1-1, this tenet of aerospace power demands that

aerospace forces should be centrally controlled by an airman to achieve advantageous synergies, establish effective priorities, capitalize on unique strategic and operational flexibilities, ensure unity of purpose, and minimize the potential for conflicting objectives. Execution of aerospace missions should be decentralized to achieve effective spans of control, responsiveness, and tactical flexibility.³⁰

Again, this is not a new conceptualization or theory. It was proven in combat and articulated in AFM 1-1's ancestral predecessor, FM 100-20, which stated:

Control of available air power must be centralized and command must be exercised through the Air Force Commander if this inherent flexibility and ability to deliver a decisive blow are to be fully exploited.³¹

What van Creveld refers to as “decentralized command” is, in fact, what the USAF calls “decentralized execution.” Decentralized execution is not in conflict with centralized control; it enhances it. In fact, application of this concept enhanced nearly all the successful maneuver operations cited in this text.

The German command system is a prime example. German armed forces all came under the unified command of the German General Staff, which was subdivided into army groups, and, in the case of air forces, further divided into *Luftflotten* (numbered air forces) that comprised “a well-rounded, balanced air force, complete in itself and capable of undertaking every sort of mission” (p. 36). Furthermore, van Creveld commends the Germans for their “unified command system that enabled them to share information throughout the forces and *to shift resources from one point to another as the leadership saw fit*” (emphasis added) (p. 43). This demonstrates precisely what the USAF has in mind with the first half of the tenet, “centralized control.”

On the other hand, each *Luftflotte* “was clearly earmarked for the support of one army group, although . . . there was no question of subordinating air force units to ground headquarters” (p. 66). In the main, the *Luftflotten* were allowed

to execute their missions as they felt necessary— decentralized execution. In van Creveld's own words, "Lower levels must be granted both the right and the means to exercise their own initiative, adapt themselves to the situation, and seize the opportune moment" (p. 7). This the *Luftflotten* (and presumably their subordinate units) were allowed to do. It worked well in numerous cases to exploit opportunities, yet when their efforts were needed elsewhere, higher command moved the *Luftflotten* whether their initial tasking was complete or not (centralized control) (pp. 88–89, 93).³²

The same applies to the Israeli Air Force, which "is not and never has been a separate service. . . . [Yet it] also functions as an operational wartime theater command. . . . [Furthermore, it] allocates squadrons to the area commands for CAS/BAI" (p. 159). Tactical control of all IAF elements is determined by the General Staff—centralized control/ decentralized execution. For that matter, far from being anathema to maneuver warfare, the Soviet system of centralized command actually represents one very functional side of centralized control/ decentralized execution, which quite effectively contributes to maneuver warfare in every case studied.

Having reviewed the potential of aerospace power to contribute to national objectives under all circumstances, it seems an inevitable conclusion that, in toto, integrated air power (and space power) represents a very comprehensive tool of national strategy, whether the subject is maneuver warfare or not. If national objectives and national capabilities can be effectively supported by maneuver warfare (which must always be our first consideration), then aerospace power is a natural for providing the kind of flexibility required. It can strike the primary blows, screen surface maneuver forces, destroy or delay enemy counterattacks, support surface forces in contact, provide comprehensive reconnaissance and surveillance, resupply isolated forces, prevent resupply of enemy forces, insert surface forces at critical points, and do just about anything else you can

imagine. In addition, it can shift from one of these roles to another much more rapidly than any other type of force.

In sum, there is *no single best way* aerospace power contributes—not close air support, not counterair, and not even interdiction. The message of modern aerospace power “missionaries” is that integrated aerospace power can do all of these—and more—“to defend the United States through control and exploitation of air and space.”³³ It is this comprehensive, integrated vision of aerospace power that advocates embrace as we prepare for the twenty-first century.

Notes

1. Giulio Douhet, *The Command of the Air*, trans. Dino Ferrari (1942; reprint, Washington, D.C.: Office of Air Force History, 1983), originally published in 1921. The reference here is, of course, to Douhet’s conceptualization that once “command of the air” was demonstrable and the consequences were understood by an embattled nation, that nation which had lost (or forfeited) it would be forced to capitulate. In his construct, surface action would be totally irrelevant. Whether airmen ascribe to this today or not, they are often saddled with the straw-man accusation that they do.

2. As used in this response, the term *air power* is interchangeable with *aerospace power*. We have continued to use the term *air power* (having made this assumption) for continuity because van Creveld has used it in the previous chapters without defining it specifically. Aerospace power is both air and space power. We consider the aerospace environment indivisible if it is to be fully exploited. See AFM 1-1, *Basic Aerospace Doctrine of the United States Air Force*, March 1992, vol. 1, 5.

3. See Edward C. Mann, “Beyond AirLand Battle: Concepts for the Future,” *Air Force Times*, 16 December 1991, 31, for a discussion of the limitations of our current view and the benefits of taking the more comprehensive view envisioned here. This is also in concert with the intent of Joint Publication 1, *Joint Warfare of the US Armed Forces*, 11 November 1991.

4. Carl von Clausewitz, *On War*, ed. Michael Howard and Peter Paret (Princeton: Princeton University Press, 1984), 87.

5. Field Manual (FM) 100-1, *The Army*, 1981, 8. Emphasis in original.

6. Americans ought to learn from Vietnam that pursuing military objectives that are unclearly defined and unrelated to discernible political objectives is a prescription for agony, frustration, and defeat. The Israelis ought to have learned the inverse lesson from their experience in 1973 that political objectives *can be* achieved while

accepting military defeat as the cost. As van Creveld points out (p. 173), the Israelis discounted the possibility of an Egyptian attack because both countries were able to analyze the assurance of an Egyptian loss on the battlefield. The Egyptians were willing to accept this cost, however, and pursued their political objectives in the face of it. Ignoring this possibility made the Israeli battlefield success much more costly than it might have been otherwise.

7. See, for instance, FM 100-5, *Operations*, 1986, 23: "A main effort is always clearly designated and ground plans are thoroughly coordinated with plans for air support." Lest there be any doubt of this bias in US Army thinking, see also page 43: "In a large-scale nuclear conflict, fire support *could* become the principal means of destroying enemy forces. The scheme of maneuver would then be designed specifically to exploit the effects of the *fire support*" (emphasis added). In other words, even when they are capable of seeing air as the main effort (in the rarest of circumstances), they can't stop themselves from continuing to view it as support of the surface force.

8. See Mary C. FitzGerald, *Russia's New Military Doctrine* (Indianapolis: The Hudson Institute, Herman Kahn Center, 1992).

9. See appendix, 3. Apparently, it is possible to discern where the *Schwerpunkt* should have been, however, since van Creveld suggests on page 7 of the appendix that for it to have been a true example of maneuver warfare, we ought to have focused efforts on "the region in front of the planned attack by VII Corps."

10. Fleet Marine Forces Manual (FMFM) 1, *Warfighting*, 29.

11. Air Corps Tactical School, *Air Force*, pt. 1, *Air Warfare*, 1 February 1938, 47, quoted in Robert F. Futrell, *Ideas, Concepts, Doctrine: Basic Thinking in the United States Air Force*, vol. 1, 1907-1960 (Maxwell AFB, Ala.: Air University Press, 1989), 88.

12. FM 100-20, *Command and Employment of Air Power*, 21 July 1943, 1, 2.

13. *Ibid.*, 6.

14. This is van Creveld's challenge to air commanders. Air theorists welcome this challenge because we believe there are many such opportunities for air. The problem, as van Creveld himself has pointed out in his discussion of later German operations on the eastern front, is to rank order them without them becoming a "fire brigade."

15. Gen Merrill A. McPeak, "Does the Air Force Have a Mission?" speech, dining in, Maxwell AFB, Ala., 19 June 1992, 5.

16. AFM 1-1, vol. 1, 5, 6, 9.

17. *Ibid.*, 9.

18. FM 100-20, chaps. 3, 7, and 8.

19. This, of course, violates van Creveld's admonition against "like-on-like" employments, but we have yet to find a more effective

counter to airplanes than airplanes. (The history of technological advance would suggest that we will someday, but it is obviously still in the future.) Fighting airplanes from the ground can impede their effectiveness, but it has never yet been able to stop determined and well-executed air attacks. According to van Creveld (p. 193), "The technology of air attack has temporarily gained the upper hand over the technology of air defense." As suggested, there is an interplay between relative effectiveness of surface-to-air and air-to-surface combat, but we are unaware of a single case where air action has been *precluded* by surface-based air defense systems acting alone. There are numerous cases of air action quickly and effectively destroying surface-to-air systems—the Bekaa Valley in 1982 and Desert Storm's initial strikes being key examples.

20. Air superiority in the case of Germany (p. 43) and Israel (p. 186); and the lack of superiority in the case of the Soviet Union (p. 136).

21. AFM 1-1, vol. 2, 104.

22. *Ibid.*, vol. 1, 6.

23. Germany (pp. 28, 44, 50–51 ff.); Soviet Union (pp. 128, 134–35, 138–39); Israel (pp. 168–72, 181–85).

24. AFM 1-1, vol. 1, 6–7.

25. Page 81: "As usual, the only force immediately available to hold off the threat was the Luftwaffe; and as was often the case during this period, it did so quickly and effectively, though at the cost of switching to battlefield operations for which many of its aircraft were not really suitable."

26. Bruce W. Watson, ed., *Military Lessons of the Gulf War* (London: Greenhill Books, 1991), 77: "[T]he inescapable conclusion is that air power virtually brought Iraq to its knees. . . ." Many have independently come to the same conclusion. In this case, the destruction of the Iraqi military was carried out primarily by air forces, supported in many ways by surface forces.

27. Page 82: "Throughout this period *Fliegerkorps IV*, with its weaker forces . . . continued to fly missions in support of Eleventh Army, which was approaching the Crimea."

28. If the first assumption is not true, we should reconsider our military objective. In the second case, we should reconsider our approach to achieving the military objective.

29. AFM 1-1, 6.

30. *Ibid.*, 8.

31. FM 100-20, 2.

32. Here the efforts of various *Fliegerkorps* were shifted as necessary by higher command (even as high as Hitler himself, in at least one case), though sometimes their first assigned mission was not complete.

33. McPeak, 10. In this speech, the general challenged air power advocates to become "today's missionaries" to "spread the word. Articulate the mission. Discuss it. Argue about it." The "new gospel" he was talking about was "air power integration."

Bibliography

Unpublished Sources

- Gordon, S. "Technology, Doctrine and Israeli Military Power." PhD diss. (Hebrew), Hebrew University, Jerusalem, 1992.
- Muller, R. R. "The German Air Force and the Campaign against the Soviet Union, 1941–1945." PhD diss., Ohio State University, 1990.
- Murray, Williamson. "The Luftwaffe and Close Air Support, 1939–1941." Unpublished paper, 1984.
- National Archives, Washington, D.C. Collection of Seized Enemy Records, 1941–, Record Group 242. Microfilm. Microfilm Publication T-314. Records of German Field Commands, Corps. 1,670 rolls.
Microfilm Publication T-315. Records of German Field Commands, Corps. 3,256 rolls.
Microfilm Publication T-321. Records of the Headquarters of the German Air Force High Command (*Oberkommando der Luftwaffe/OKL*). 172 rolls.
Microfilm Publication T-405. German Air Force Records: *Luftgaukommandos, Flak, Deutsche Luftwaffenmission in Rumaenien*. 64 rolls.
Microfilm Publication T-971. The Von Rohden Collection of Research Materials on the Role of the German Air Force in World War II, 1911–1947. 60 rolls.
- OKL, Generalstab*, 8. Abteilung. "The Douhet Theory and Its Application to the Present War." Air Historical Branch, Translation No. 7/11, USAFHRC, 521.621.
- Pawloski, D. "Changes in the Threat: Air Combat Doctrine and Force Structure." General Dynamics, February 1992.

Published Sources

- Adan, Avraham. *On the Banks of the Suez*. London: Arms and Armour Press, 1980.
- Amidror, B. "The Race for El Arish." *Haolam Hazeh* (Hebrew). 26 February 1975.

- Armitage, M. J., and R. A. Mason. *Airpower in the Nuclear Age, 1945–1984: Theory and Practice*. New York: Macmillan, 1985.
- Asprey, Robert B. *The First Battle of the Marne*. Philadelphia: Lippincott, 1962.
- Bar-On, Mordechai, ed. *Israeli Defense Forces in the Six Day War*. Tel Aviv: Ministry of Defense, 1968.
- Bartov, H. *Dado: 48 Years and 20 Days* (Hebrew). Tel Aviv: Ma'ariv Book Guild, 1981.
- Boog, Horst. *Das deutsche Reich und der Zweite Weltkrieg. Vol. 4, Der Angriff auf die Sowjetunion*. Stuttgart: Deutsche Verlags-Anstalt, 1983.
- _____. *Die deutsche Luftwaffe, 1939–1945: Fuehrungsprobleme - Spitzengliederung - Generalstabsausbildung*. Stuttgart: Deutsche Verlags-Anstalt, 1982.
- Boyd, Alexander. *The Soviet Air Force since 1918*. New York: Stein and Day, 1977.
- British Air Ministry. *The Rise and Fall of the German Air Force, 1933–1945*. London: H. M. Stationery Office, 1948.
- Brower, Kenneth S. "The Economic Implications of Military Doctrine and Weapons Decisions," in Royal Military Academy, *Gorbachev, Economics and Defence*. Sandhurst: Soviet Studies Research Centre, 1987.
- Canby, Steven L. *The Operational Limits of Emerging Technology*. Adelphi Paper No. 198. London: International Institute of Strategic Studies, Summer 1985.
- Cassidy, Henry C. *Moscow Dateline, 1941–1943*. Boston, Mass.: Houghton Mifflin, 1943.
- Chairman, Joint Chiefs of Staff. *Overseas Mission Study*. Washington, D.C.: Department of Defense, June 1991.
- Chandler, David G. *The Campaigns of Napoléon*. New York: Macmillan, 1966.
- Clausewitz, Carl von. *On War*. Edited and translated by Michael Howard and Peter Paret. Princeton, N. J.: Princeton University Press, 1976.

- Cooper, Matthew. *The German Air Force, 1933–1945*. London: Jane's, 1981.
- _____. *The German Army*. New York: Stein and Day, 1978.
- Creveld, Martin van. *Command in War*. Cambridge, Mass.: Harvard University Press, 1985.
- _____. *Hitler's Strategy, 1940–1941: The Balkan Clue*. London: Cambridge University Press, 1973.
- _____. *Supplying War: Logistics from Wallenstein to Patton*. London: Cambridge University Press, 1978.
- _____. *Technology and War*. New York: Free Press, 1989.
- _____. *The Training of Officers: From Military Professionalism to Irrelevance*. New York: Free Press, 1990.
- _____. *The Transformation of War*. New York: Free Press, 1991.
- Dayan, Moshe. *Story of My Life*. Boston, Mass.: William Morrow, 1976.
- Dayan, Yael. *Israel Journal, June 1967*. New York: McGraw-Hill, 1967.
- Deichmann, Paul. *Der Chef in Hintergrund: ein Leben als Soldaten von der preussischen Armee bis zur Bundeswehr*. Oldenburg: Stalling Verlag, 1979.
- _____. *German Air Operations in Support of the Army*. USAF Historical Study No. 163. Maxwell AFB, Ala.: USAF Historical Division, Air University, 1962.
- Documents on German Foreign Policy*, series D., vol. 1. London: H. M. Stationery Office, 1949.
- Donnelly, Christopher. *Red Banner: The Soviet Military System in Peace and War*. London: Jane's Information Group, 1988.
- _____. "The Development of Soviet Military Doctrine." *International Defense Review*, no. 12 (1981).
- Dorgeles, A. *La Drôle de Guerre*. Paris: Michel, 1971.
- Doughty, Robert A. *The Breaking Point: Sedan and the Fall of France, 1940*. New York: Archon Books, 1990.
- Dupuy, Trevor N. *Elusive Victory: The Arab-Israeli Wars, 1947–1974*. New York: Harper and Row, 1978.

- Eichelbaum, E. Hans, ed. *Das Buch von der Luftwaffe*. Berlin: Bong, 1938.
- Elbe, R. *Die Schlacht an der Bzura in September 1939 aus deutschen und polnischen Sicht*. Freiburg im Breisgau: Rombach, 1975.
- Ellis, Lionel F. *The War in France and Flanders, 1939–1940*. London: H. M. Stationery Office, 1953.
- English, John A. *A Perspective on Infantry*. New York: Praeger, 1981.
- Erickson, John. *The Soviet High Command: A Military-Political History, 1918–1941*. Boulder, Colo.: Westview Press, 1984.
- Erickson, John, Lynn Hansen, and William Schneider. *Soviet Ground Forces: An Operational Assessment*. Boulder, Colo.: Westview Press, 1986.
- Feuchter, Georg W. *Geschichte der Luftkrieg*. Frankfurt am Main: Athenaeum, 1954.
- Foerster, Wolfgang, ed. *Friedrich Karl von Preussen: Denkwuerdigkeiten aus seinen Leben*. Stuttgart: Deutsche Verlag, 1910.
- Garder, Michel. *La Guerre Secrete des Services speciaux francaises, 1939–1945*. Paris: Plon, 1967.
- Generalstab der Luftwaffe. *Die Luftkriegfuehrung*. Berlin, 1935.
- Goldring, Natalie J. *The Conventional Balance: How Far beyond the Bean Count Are We?* Defense Budget Project, June 1989.
- Greenhous, Brereton. "Evolution of the Close Combat Support Role for Aircraft in World War I." *Military Affairs* 21, no. 1 (February 1975).
- Guderian, Heinz. *Panzer Leader*. London: Joseph, 1953.
- Halder, Franz. *Kriegstagebuch*. Stuttgart: Kohlhammer, 1962.
- Handel, Michael I. *Israel's Military-Political Doctrine*. Cambridge, Mass.: Center for International Affairs, Harvard University, 1973.

- Haykal, Muhammed. *The Road to Ramadan*. London: Collins, 1975.
- Hillgruber, Andreas. *Hitlers Strategie: Politik und Kriegfuehrung, 1940–1941*. Frankfurt am Main: Bernhard und Graefe, 1965.
- Hoepfener, Ernst Wilhelm von. *Deutschlands Krieg in der Luft: Ein Rückblick auf die Entwirklung und die Leistungen unserer Heeres-Luftstritkräfte im Weltkrieg*. Leipzig: Koehler und Umland, 1921.
- Hoeffding, Oleg. *Soviet Interdiction Operations, 1941–1945*. Rand Report R-556PR. Santa Monica, Calif.: Rand Corporation, 1970.
- Hoth, Hermann. *Panzeroperationen*. Heidelberg: Vowinckel, 1956.
- Hough, Richard, and Denis Richards. *The Battle of Britain*. New York: Norton, 1990.
- Horne, Alistair. *To Lose a Battle: France 1940*. London: Macmillan, 1969.
- Illan, M. "The Use of Surprise in the Sinai Campaign" (Hebrew). *Maarachot*, October 1966.
- Jacobsen, Hans A. *Fall Gelb: Der Kampf um der deutschen Operationsplan zur Westoffensive 1940*. Wiesbaden: Steiner, 1957.
- Jackson, Robert. *The Israeli Air Force Story*. London: Stacey, 1970.
- _____. *The Red Falcons: The Soviet Air Force in Action, 1919–1969*. Brighton, Mass.: Clifton Books, 1970.
- Kessel, Eberhard. *Moltke*. Stuttgart: Koehler, 1957.
- Kesselring, Albert. *Kesselring: A Soldier's Record*. New York: William Morrow and Co., 1954.
- Kilmarx, Robert A. *A History of Soviet Air Power*. New York: Praeger, 1962.
- Kurowski, Franz. *Balkenkreuz und roter Stern: der Luftkrieg ueber Russland, 1941–1944*. Friedberg: Puzdun, 1984.
- Liddell Hart, B. H. *Europe, Deterrent or Defense*. New York: Praeger, 1960.

- _____. *History of the Second World War*. New York: Putnam, 1971.
- _____. *Strategy*. New York: Praeger, 1954.
- Lind, William S. "Maneuver Warfare and Marine Aviation." *Marine Corps Gazette*, May 1989.
- Ludendorff, Erich von. *The Nation at War*. London: Hutchinson, and Co., Ltd., n.d.
- Luttwak, Edward N., and D. Horowitz. *The Israeli Army*. New York: Praeger, 1975.
- Maier, Klaus A. *Germany and the Second World War*. Vol. 2, *Germany's Initial Conquests in Europe*. Oxford: Clarendon Press, 1991.
- _____. *Guernica, 26.4.1937: die Deutsche Intervention in Spanien und der "Fall Guernica."* Freiburg: Rombach Verlag, 1975.
- Manstein, Erich von. *Lost Victories*. London: Methuen, 1958.
- Melzer, Walther. *Albert Kanal und Eben Emael*. Heidelberg: Vowinkel, 1957.
- Murphy, Paul J., ed. *The Soviet Air Forces*. Jefferson, N.C.: McFarland and Co., 1984.
- Murray, Williamson. *Strategy for Defeat: The Luftwaffe 1933-1945*. Maxwell AFB, Ala.: Air University Press, 1983.
- _____. "A Tale of Two Doctrines: The Luftwaffe's 'Conduct of the Air War' and the USAF's Manual 1-1." *Journal of Strategic Studies* 6 (December 1983).
- Nietschmann, Bernard. "The Third World War." *Cultural Survival Quarterly* 11, no. 3 (Fall 1987).
- Norden, Lon O. *Fighters over Israel*. New York: Orion Books, 1990.
- Plocher, Hermann. *The German Air Force versus Russia, 1941*. USAF Historical Study No. 153. Maxwell AFB, Ala.: USAF Historical Division, Air University, 1965.
- Proctor, Raymond L. *Hitler's Luftwaffe in the Spanish Civil War*. Westport, Conn.: Greenwood Press, 1983.
- Report of the European Security Study. *Strengthening Conventional Deterrence in Europe: Proposals for the 1980s*. New York: St. Martin's Press, 1983.

- Rohden, Herhudt von. "Die Planung und Vorbereitung des Luftkrieges gegen Polen in 1939." *Luftkrieg*, no. 5 (1946).
- _____. *Vom Luftkriegfuehrung: Gedanken ueber Fuehrung und Einsatz moderner Luftwaffen*. Berlin: Mittler, 1938.
- Ritter, Gerhard. *The Schlieffen Plan: Critique of a Myth*. New York: Praeger, 1958.
- Rothbrust, Florian K. *Guderian's XIXth Panzer Corps and the Battle of France*. New York: Praeger, 1990.
- Royal Military Academy. *The Sustainability of the Soviet Army in Battle*. Sandhurst, England: Soviet Studies Research Centre, September 1986.
- Sandrart, Hans-Henning von. "Forward Defense—Mobility and the Use of Barriers." *NATO's Sixteen Nations*, no. 1, 1985.
- Savkin, Vasilii Y. *The Basic Principles of Operational Art and Tactics (A Soviet View)*. Translated and published under the auspices of the United States Air Force. Washington D. C.: Government Printing Office, 1974.
- Schramm, Percy E., ed. *Kriegstagebuch des Oberkommando der Wehrmacht*, vol. 1. Frankfurt am Main: Bernhard und Graefe, 1965.
- Schwabedissen, Walter. *The Russian Air Force in the Eyes of the German Commanders*. USAF Historical study no. 175. Maxwell AFB, Ala.: USAF Historical Division, Air University, 1960.
- Seaton, Albert. *The Russo-German War, 1941–1945*. London: Weidenfeld and Nicolson, 1971.
- Seeckt, Hans von. *Thoughts of a Soldier*. London: E. Benn, Ltd., 1930.
- Sharon, Ariel. *Warrior: The Autobiography of Ariel Sharon*. New York: Simon and Schuster, 1989.
- Shazli, Saad. *The Arab Military Option*. San Fernando, Calif.: American Mideast Publishing, 1986.
- _____. *The Crossing of the Suez*. San Francisco, Calif.: Presidio Press, 1980.

- Sidorenko, A. A. *The Offensive (A Soviet View)*. Translated and published under the auspices of the US Air Force. Washington, D.C.: US Government Printing Office, 1973.
- Smith, Peter C. *Close Air Support: An Illustrated History, 1914 to the Present*. New York: Orion Books, 1990.
- Suchenwirth, Richard. *The Development of the German Air Force, 1918–1939*. USAF Historical Study No. 160. Maxwell AFB, Ala.: USAF Historical Division, Air University, 1968.
- Thomas, David. "The Importance of Commando Operations in Modern Warfare." *Journal of Contemporary History* 18 (October 1983).
- Trevor-Roper, H. R. *Hitler's War Directives, 1939–1945*. London: Sidwick and Jackson, 1964.
- Uebe, Klaus. *Russian Reactions to German Airpower in World War II*. USAF Historical Study No. 176. Maxwell AFB, Ala.: USAF Historical Division, Air University, 1964.
- Voight, K. *Conventional Defence in Europe: A Comprehensive Evaluation*. North Atlantic Assembly Papers, December 1985.
- Wallach, Jehuda. *Kriegstheorien*. Frankfurt am Main: Bernhard und Graefe, 1971.
- Warlimont, Walter. *Inside Hitler's Headquarters, 1939–1945*. London: Weidenfeldt and Nicolson, 1962.
- Weinraub, Yehuda. "The Israeli Air Force and the Air Land Battle." *IDF Journal* 3 (1986).
- Zaloga, Steve J. *Armor in the Middle East Wars, 1948–1973*. London: Asprey Publishing Ltd., 1981.

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